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Michigan Avenue at Wacker Drive

The Home of
finish

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finish

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CHICAGO MILL AND LUMBER COMPANY

111 W. Washington Street

Chicago 2, Illinois

THE *Finish* Line

YOU will unquestionably have assumed before reading this column that some satisfactory arrangement was completed for the continuation of *finish* — otherwise you would not have received this April issue:

Decision required study

From the viewpoint of the enameling industry and Dana Chase Publications the answer to the question of allowing the small amount of paper required for the continuation of this publication might appear to be comparatively simple. As it developed, however, the final decision of the Appeals Board was given only after an extended study of the case. The Administrator of the magazine order had his reasons for objecting to a quota for *finish*, and he was on the job to present them forcefully before the Appeals Board.

Final decision favorable

The only point that seems important to the publisher and readers of *finish* at this time is that permission has been granted for the continuation, on a permanent basis, of this first and only independent publication serving the porcelain enameling and ceramic finishing field.

Paper specified

The weight of paper which is used for this issue, and which will be used for subsequent issues until paper restrictions are relieved, was specified by the War Production Board. It is a bit disappointing for the "camera bug" or the critic of fine photographic reproduction, such as represented in the January *finish*, to see good engravings "murdered" through the use of uncoated stock. But if the saving of even so small an amount of paper as this represents offers a "wee bit" of assistance in connection with the conservation program, I am sure we are all willing to concede something from the "artistic" standpoint in the interest of war-time conservation.

The heart of any technical or semi-technical trade publication should be its editorial content, and we are happy to tell you that the "quantity" of paper allotted is sufficient to insure the complete publication of all important industry data and information.

Thanks again

We again want to express our appreciation to the contract advertisers and their agencies who have been exceedingly patient through a period when it was impossible for *finish* to supply definite information with regard to future schedules. It has been necessary to return contracts from new advertisers desiring space in *finish* due to the uncertainty of the situation.

With the uncertainty eliminated you will see *finish* grow, and we hope to assist in the future growth of the industry as well.

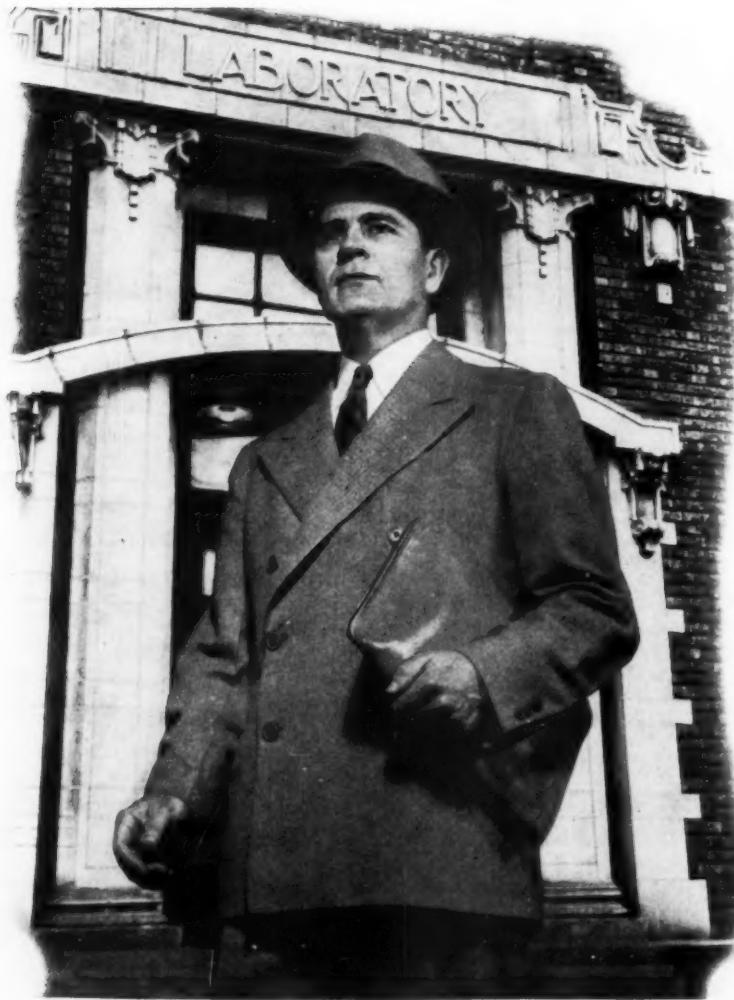
A late issue

Closing date for the April issue of *finish* would normally be March 15, but it was not until March 29 that we received the welcome news from Washington that we were to be permitted to continue publication, effective April 1. This accounts for the tardiness in your receiving this issue. It is not too unfortunate, however, as it made it possible for us to give you a *complete* story of the A.C.S. Convention which would normally appear in the May issues of trade publications.

A new start

Now that the "paper situation" is settled we hope there will be no necessity for further reference to it on this page. We are off to a fresh start in our attempt to give the industry the type of publication it justly deserves.

Dana Chase



Our Metallurgists Are Ready to Help You

In these critical days, when quick and specific results are imperative, America must make full use of the best it possesses in expert training and experience. That is why we urge you to take advantage of the knowledge of Inland metallurgists.

They are men with many years' experience in fine steelmaking, in applying iron and steel to products of varied and intricate design, and in the best methods of fabrication. They are accustomed to tackling difficult jobs. Their record of success is remarkable.

Inland metallurgists do not confine their work to

laboratories. They have had many years of experience with the problems of metal working plants. They work with iron and steel, and make them work for others.

Possibly you suspect there is a better or faster way of producing parts for your products. Perhaps you have a fabrication or enameling problem that is troublesome. Looking ahead, you may be thinking about the redesign of products and development of new products that will be needed for future markets.

Whatever your need, our metallurgical department is ready and anxious to serve you.

SHEETS • STRIP • TIN PLATE • BARS • PLATES • FLOOR PLATE • STRUCTURALS • PILING • RAILS • TRACK ACCESSORIES • REINFORCING BARS



INLAND STEEL COMPANY

38 S. Dearborn St., Chicago 3, Illinois

Sales Offices: Cincinnati • Detroit • Kansas City • Milwaukee • New York • St. Louis • St. Paul

The how and why of sign advertising

By Ken M. Davee • DAVEE, KOEHNLEIN AND KEATING, CHICAGO, ILLINOIS

PART I • Introduction

a great job that we can't get our salesmen to duplicate."

"We've had numerous requests recently for a truck sign that we can furnish to our dealers. What are other companies doing about a standardized truck sign?"

"Do other advertisers distribute signs according to the sales value of each outlet or according to the traffic value at a particular location? See what I mean? I've noticed large, costly signs on outlets where I know the sales couldn't possibly justify that much promotion. Do they consider the outdoor advertising value in terms of traffic at each location?"

"What sort of arrangement can we

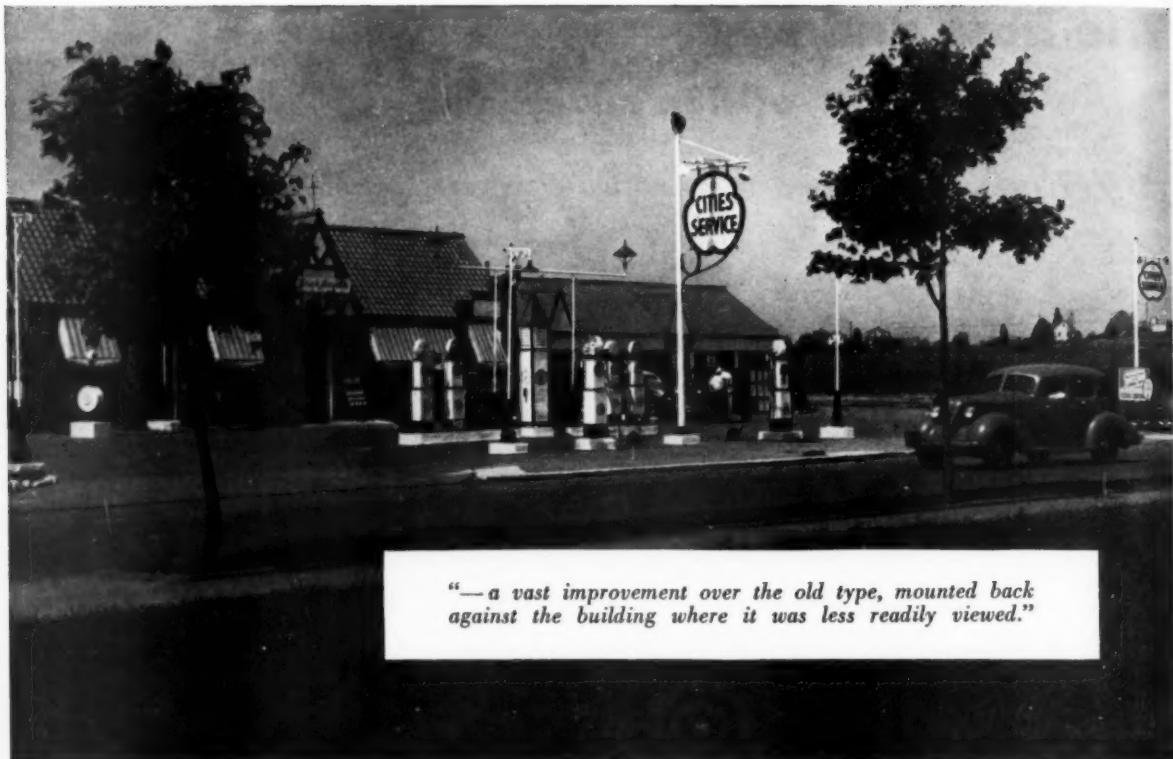
set up so that we can reclaim a sign the minute a dealer cancels his franchise? We've had cases where an auction company called in to liquidate a dealer's stock would take our sign and move it from store to store in the course of their auctions, drawing people in with our name even though none of our stock was available."

"We're having plenty of trouble with our banner store front signs in the South. What can we do to get a sign that will hold in our colors down there?"

"Is there any information available on the right colors to use in a sign for a soft drink? What should



"Advertising managers want to know not only why signs should be used, but also where and how to use them."



"—a vast improvement over the old type, mounted back against the building where it was less readily viewed."

guide you in color selection anyway?"

"We have four lines of products sold through hardware stores and mill supply houses. How can we work out a standard identification sign that will tie all four of these products together in the buyer's mind?"

Research program behind this series

That gives you some idea of the interest sign users show in the problem of getting the most out of their sign advertising. It is to answer questions such as these, and to stimulate an exchange of information, that this series of articles was prepared.

Surveys were made to get a factual record of actual sign usage in a typical market.

Large sign users known to have developed certain effective techniques were interviewed and asked to contribute their experience.

Authorities in the field of advertising, light, color, layout and design, material selection and all the other fields bearing on sign advertising were consulted, and their findings are summarized in this series.

Sign buying a routine with many

While an increasing number of large advertisers, as well as up-to-date merchants and dealers, are paying more attention to signs, many continue to buy them as they have for years without giving much thought to them. Some advertisers buy signs without much consideration of the reasons why. To the advertising manager of a building supply house, a man responsible for purchasing thousands of signs each year, this question was put:

"Why do you buy signs?"

He "guessed" that he didn't have a ready answer and studied the regular semi-annual inventory report which the accounting department had just furnished him. This report listed, along with other sales promotional items, his stockroom inventory of signs.

The list of signs was a long one, for his house manufactured a number of nationally advertised products. The total number on hand ran well into five figures. Why did he buy signs?

"Well," he said, "I guess it's just

because our dealer asks us for 'em."

That is good enough reason for any sales manager. His dealers wanted them. But shouldn't he have gone a little farther? If he had, he would have discovered what many aggressive organizations know — that signs are *advertising*.

Many a sign buyer doesn't realize that he is doing anything more than identifying a dealer when he buys a storefront sign. That identification in itself is important, of course. It justifies many times over the reasonable cost of a good sign. But signs do more than that. They *advertise*. An inspection today of the sign campaigns of many advertisers reveals that they have discovered that storefront sign advertising pays. They know what they are buying. And it is advertising value that they buy, as well as that all-important final identification and point-of-sale reminder value just before the customer steps up to the counter.

Sign advertising continues to grow

Before the war the use of well-planned signs continued to increase. Sign advertising was progressing

steadily in spite of the fact that it had been taken pretty much for granted. This is surprising to some people until they learn what sign advertising really is. They fail to think of sign advertising as the identification over their favorite A & P or Woolworth store—the "authorized dealer" sign over their service garage. It is the colorful spectacular that they point to with pride when out-of-town guests are visiting them. (Many of the largest of these have been blacked out during the war.) There's no doubt about it, sign advertising is increasing, or was before the war. The major petroleum marketing companies were using more and better dealer signs than ever before prior to Pearl Harbor. So were tire manufacturers, coal companies, brewers, baking companies, cigar manufacturers, the bottlers and the leaders in a dozen other industries.

The value of sign advertising is generally accepted, and in peacetime most business organizations would utter startled cries of protest at any suggestion that all existing advertis-

ing signs be removed and all further appropriations for this medium eliminated.

Yet the plain fact is that when brought face to face with the question, like the advertising manager of the building supply house mentioned earlier, there are many who consider signs just another unavoidable expense of operation. So far as they are concerned, signs are an expense like order forms and stationery.

Very little has been done generally to investigate the justification for sign advertising and measure the value of the results it produces. The use of signs for identification and advertising has increased nevertheless, and that is convincing evidence of their genuine worth. During times of stress, however, sign appropriations suffer. This showed up in the investigation. More than 20 per cent of the advertisers replying that they used less sign advertising than a decade ago gave smaller appropriations as the only reason. Clearly, appropriations for signs had been cut because no one could give facts

regarding the benefits resulting from the use of advertising signs.

Who has the facts?

Why should this situation exist? Was sign advertising the place to cut? Did the dollars invested in sign advertising produce less results than those spent in other media—newspapers, magazines, radio, direct mail, window display, dealer helps? Who knows? Who has measured the value of sign advertising?

Obviously certain large sign users have some facts. They know something of the methods that will insure best results. Coca-Cola and other bottlers would not continue to provide increasing sign coverage year after year without some definite indications of the resulting advertising value in terms of sales.

One large department store chain submitted various types of signs to a series of tests in order to determine their comparative value. Another advertiser used roadside signs around a test city and measured the results. For more than fifty years American

Over →

"It is the colorful spectacular that they point to with pride when out-of-town guests are visiting them."

CHEVROLET

OFFERING THE GREAT.

DRINKS ON ME

business has piled up experience in sign advertising. But thus far none of it has been collected, organized and released to sign manufacturers, sign users, prospective users, advertising agents, and students of advertising and marketing.

It is high time these facts were collected in useful form. An advertising medium that takes as much as 33 per cent of some advertisers' budgets, and a significant proportion of the advertising expenditure of the average organization with a national dealer setup, deserves some careful analytical attention.

Sales managers, for instance, want to know what to expect from their expenditures for sign advertising.

Advertising managers want to know not only *why* signs should be used, but also *where* and *how* to use them.

Presidents and treasurers of many companies — and the boards of directors as well — want to know the facts about the advertising results produced by signs.

Executive leaders interested in sign advertising

The interest which top rank executives have in the signs with which their branches and dealers are identified is not surprising. They realize that the point of contact their organization has with its customers — at the dealer's or agent's place of business — is the vitally important link in their distributive system and a factor of paramount significance in determining the organization's success.

The president of Western Union is reported to have returned from one of his field trips with the suggestion that a sign be developed that would exemplify and advertise the exact service the company sells — the service identified everywhere by the yellow blank with the black lettering. Accordingly a new sign was designed — the blank reproduced faithfully in color with a sales message for all who saw it.

The Goodyear Rubber Company was one of those who recognized that the signs with vertical lettering — long a tradition in the service station and auto supply field — were difficult to read, and he decided on their re-

placement with signs on which the copy read horizontally.

This change prompted a study which revealed the fact that an identification sign should be displayed near the curb on a post where the motorists could see it — a vast improvement over the old type, mounted back against the building where it was less readily viewed. This seems obvious now, but previously advertiser after advertiser in this field was content to build long, vertical signs and mount them obscurely where they could not be seen from the street.

A practical collection of sign advertising experience

This interest in signs on the part of all users indicates the need for factual information — the experience of other sign users. In this series you will find the sign advertising

Editor's Note:

Sign manufacturing has been, and unquestionably will continue to be a very important division of the porcelain enameling industry. As is common knowledge, this division of our industry was hard hit in the early days of the war due to curtailment of necessary material. The date at which steel signs can again be manufactured in large quantities is decidedly in question, but it seems reasonable to your editor that those primarily interested in the production and use of signs should now be preparing plans for the future.

The series of articles, starting with Part I in this issue, are based on a thorough pre-war research investigation made by the firm of Davee, Koehlein and Keating so that it is based on "normal" conditions. By projecting the facts contained in this series to post-war years it should be possible for both manufacturers and users to draw upon the information in connection with post-war plans to the ultimate gain of everyone concerned.

Sign manufacturers will find in this series valuable information obtained from users, both large and small, throughout the country.

Sign users will find valuable data for comparison with their own experiences for planning future sign advertising programs and appropriations.

experience of 800 companies located from Boston to Los Angeles; from Fort Worth to Buffalo.

There is information to guide the development of signs every step of the way, from the original conception of the need and the means of getting a campaign underway right straight through to effective sign maintenance. While the emphasis is on the development of signs for use in quantities over a wide marketing area, there is still plenty of material of value to the man interested in a single sign for his store or service outlet. The same principles of copy and layout and of figuring the value received from a sign apply in either case.

Every fact given is based on experience or the counsel of authorities in each specific field. If you are a producer of signs you will find much material with which you are already familiar, but in addition you will read data which should be of value for comparison with your own experiences — data which it is hoped will be helpful in designing your post-war manufacturing plan.

If you are a large user of signs you may recognize some of the information as that which you have yourself contributed. In any event, the information offered will serve as a cross check with your own sign experience with regard to problems covering appropriations, distribution, etc.

Every manufacturer, large or small, would normally be interested in some type of sign advertising, however modest the total appropriation might be. The result of these articles it is hoped will be the dissemination of ideas that will help both the manufacturer and the user in connection with present plans for future activity.

How important are signs to large chain stores? Why do bottling companies use up to 50% of their advertising appropriations for signs? How is sign copy tied in with magazine and radio advertising? Read the answers to these and other questions in Part II of this series to appear in the April issue of *finish*.

Canned heat for Berlin-Tokyo

By Harold B. Gray • VICE PRESIDENT, VITREOUS STEEL PRODUCTS CO., NAPPANEE, IND.

The author and finish are indebted to Chicago Chemical Warfare Procurement District, Col. Harry R. Lebkicher, Commanding Officer, for cooperation in the preparation of this story.

(ALL PHOTOGRAPHS BY U. S. ARMY SIGNAL CORPS)

When we read of the fires taking place in Berlin and other important German cities there is usually reference to "thousands upon thousands of incendiaries."

When the good news arrives that Tokyo is feeling the sting of the A.A.F. we may be sure there will be many references to destruction through the use of incendiary bombs. It is entirely possible that some credit for successful results in these campaigns of "fire" should trickle back to members of the porcelain enameling industry, as manufacturers in this industry have been responsible for the production of millions of such bombs. Other manufacturers who normally produce materials for porcelain enameling have, during the war, been making the fire-producing elements which make the magnesium incendiary so effective.

"Main Street" bomb maker

This story concerns itself with one enameling unit which has produced millions of the magnesium castings forming the bomb body, under contract with Chemical Warfare Service. The company is Vitreous Steel Products, with headquarters in Cleveland, Ohio, and with its enameling plant in Nappanee, Indiana, the "Main Street" of this story.

The company's early investigation into the production of permanent mold magnesium castings came as a natural result of experience in connection with permanent mold aluminum. When we found that there was a need for incendiary bombs by Chemical Warfare we immediately started experimental work on our own initiative.

Four men from the Nappanee plant were sent to Cleveland. One to learn about molds, one to learn about furnaces, and two to get all the information possible about magnesium.

They came back, and in two weeks built a furnace and cast a bomb. Everybody worked resolutely and the results were worth while. The first bomb was good.

Our company president, Mr. Edgar H. Weil, presented the bomb to Chemical Warfare Service with the statement, "Gentlemen, there it is. How many do you want?" He got a trial order which was soon followed by a production order. That was in the summer of 1942, and we have had continuous orders for maximum production since that time.

The company is now one of the largest producers of the magnesium incendiary bomb bodies, and is also making permanent mold magnesium castings for aircraft engine parts—supplying to a half-dozen different manufacturers.

The Nappanee plant normally produces table tops, refrigerator parts, signs, and does all types of enamel jobbing work.

As soon as the C.W.S. contract was signed, building facilities were increased through the addition of two new buildings to house the foundry and machine shop. Heat treating equipment for aluminum and magnesium, continuous pickling equipment and necessary machine tools were also added. The rest of the plant was re-organized as required to meet the new production requirements.

While, as has been indicated, the company was familiar with procedures in connection with the use of the lighter metals, the work required in building bomb bodies was com-

pletely new to both plant management and workmen at the Nappanee plant. Outside engineering was obtained, but all production results described in this article were attained with the existing organization and the Nappanee "Shock Troops."

Aside from the men in the organization who have been called into the Service, a majority of the old employees of the fabricating and enameling plant shifted to the new task of making "Tokyo fire."

In the Service

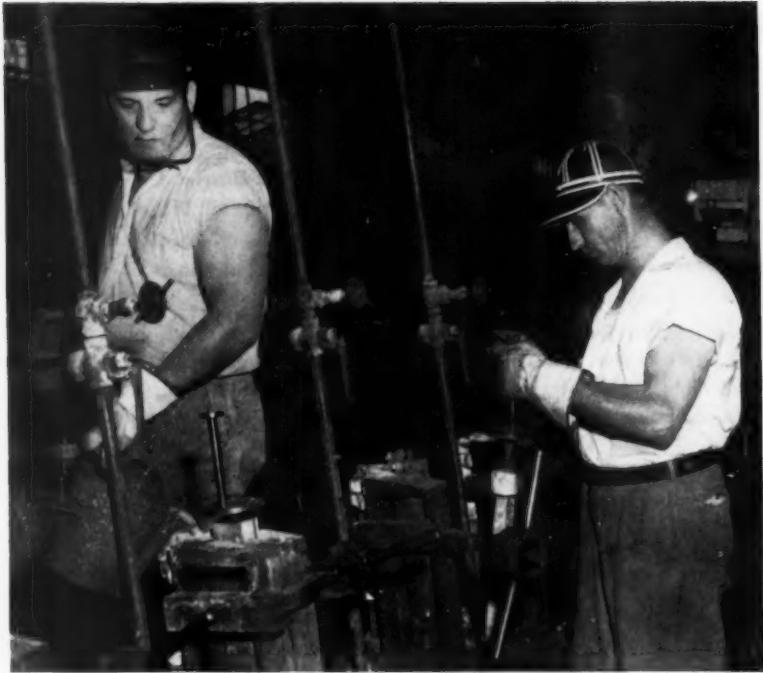
George Landis, former assistant superintendent, now a Major in the Field Artillery, entered the Service right after Pearl Harbor, acted as a gunnery instructor at Fort Sill for nearly a year, and then helped to organize the division of which he is now a part.

Melville Combs, former enameling foreman, is now a Major in the Tank Corps somewhere in the Pacific Area.

Johnny Richmond, one of the boys in the office, is now a Lieutenant piloting a bomber somewhere in the European Theatre.

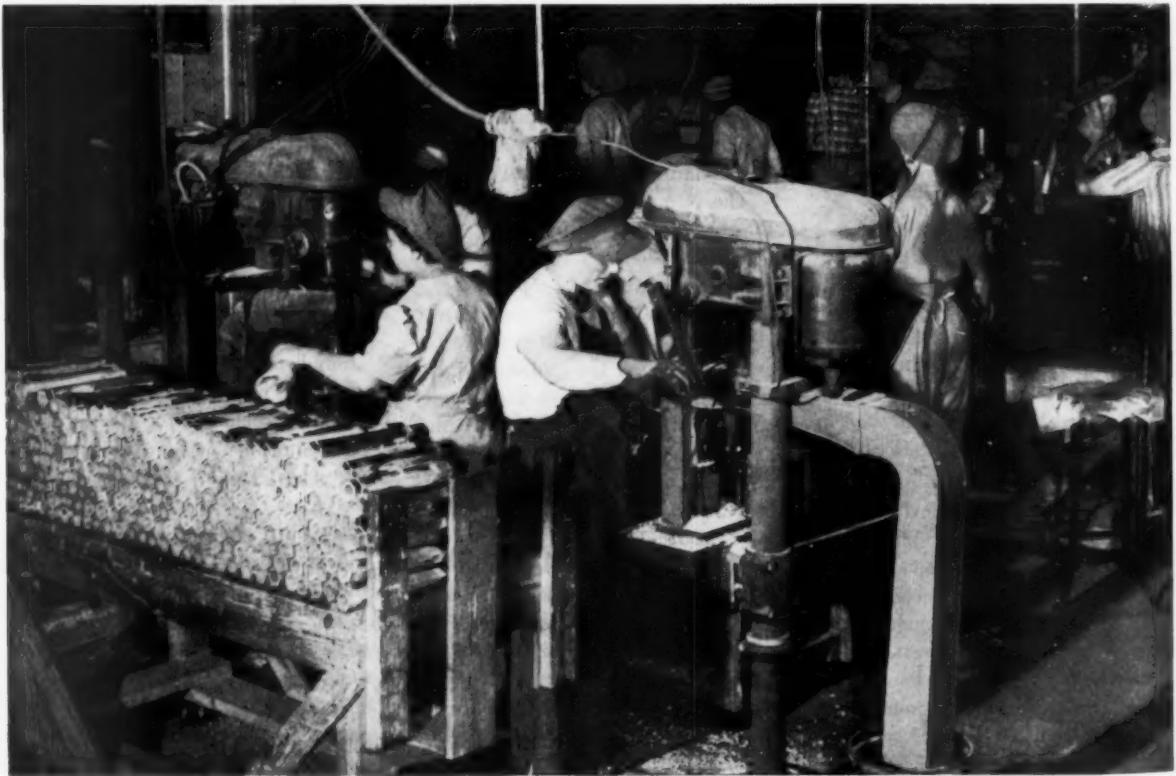
Ralph Stahley, who was in charge of the millwright crew, is in the Engineering Corps; LaMar Reed, all-around man in the fabricating department, is a paratrooper somewhere in Italy; Richard Stuckman, also an all-around man in the fabricating department, is now a Corporal somewhere near the Aleutians; and Willard Miller, assistant in the millroom, joined the Air Corps early in the game — present address unknown.

There are many others scattered all over the world at the present time who are looking forward to the day when they can get back to Nappanee. They say they want to finish the job they have started and get



Pouring magnesium castings in metal molds. Man at left is pouring—man at right, removing castings from the mold.

A number of miscellaneous machining operations are required in the manufacture of the bomb bodies.



back to Vitreous Steel and their fabricating and enameling jobs.

The working crew was gradually built up to three times normal employment for the plant and production geared to run around the clock. With this increased production the actual handling of incoming material and outgoing bomb bodies became a problem. This leads us to a most interesting part of our story.

Shock troops for industry

When the labor situation became acute it was apparent vital war production would be delayed if some solution were not found. Citizens of Nappanee rose to the occasion and proved their loyalty to one of the principal hometown industries by keeping the foundry fires burning at Vitreous Steel Products Company, and likewise proved their loyalty to the fighters over seas who are depending on such companies for the production of destructive weapons.

The citizens of Nappanee knew if production schedules were slowed down fewer bombs might be dropped over Axis cities. As proof of their patriotism several leading citizens

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answered the urgent call of factory management to aid in the production program. Among the numbers of the "Shock Troops" are the two sons of the editor of the town's weekly newspaper, Nappanee Advance-News, Howard and Glen Field; a school teacher, James R. O'Neil; two milkmen; an undertaker; a gas service station owner; and a pair of attractive 17 year old twins, Joan and June Tobias, whose brother, Pvt. Carlyle Tobias, is with an armored division over seas.

Mr. O'Neill is a typical example. He teaches reading and geography, and coaches the tennis and basketball teams in the town's junior high school. During the evenings he is usually at home awaiting a possible telephone call from the factory to report for work on the night shift or "sleeper trick." When asked as to whether he minded this additional emergency work he said, "If this little bit of factory work that I do will help crush the Axis, then I will feel sort of proud to know that I had a hand in the victory to come."

Howard Field, one of the publisher's "Shock Troop" sons, is also a



Careful inspection of the machined castings is required. This photograph shows the castings being inspected.

These girls are cleaning the exterior of the bomb castings in a broach.



member of the City Council. His brother, Glen, is a linotype operator for the newspaper. Both stand ready to hop over to the factory for work on the bombs as required.

Another active citizen is Mrs. Violet Gall, 36, the mother of five children ranging from 3 to 14 years of age. Mrs. Gall performs a man's job by operating a salvage press.

Two other citizens have filled important jobs as C.W.S. inspectors. Mrs. Helen Best went to work in the plant when her husband, Sgt. Wayne Best, joined the Army. Mrs. Mary Dunham has been working in the plant for a number of months. She has one brother with Chemical Warfare Service, and another with the Army Air Corps—one helping to get the right materials made and started on their way, the other helping to make sure they reach the proper destination.

These are a few typical examples of the labor relief methods used to meet necessary production requirements. There is never a hurry-up call, day or night, as a result of sickness on the production line, the arrival of necessary materials, or the scheduled departure of finished parts that there is not someone ready and willing to answer the call and keep the production lines and cars moving. Each day's production requires many thousands of cast iron nosepieces, tons of magnesium, hundreds of heavy cartons containing finished goods—takes good men—Nappanee has them.

Porcelain enameling

Our normal business of porcelain enameling has taken a decided "back seat" during the war but still makes up, in a small way, a part of our war work.

Vitreous Steel was, I believe, the first company to operate a continuous enameling furnace on a commercial production basis. The first continuous furnace, built in 1925, was a circular "rotary" job designed to fire table tops. Compared with present day furnaces, such as the company now uses, it left much to be desired but it was a vast improvement over the box furnace of that time.



The Tobias twins — Nappanee "Shock Troopers."

One obvious disadvantage referred to in connection with this early furnace was the single 10 ft. opening which had to be used both for loading the unfired parts and unloading the *hot* ware. With this equipment a man could unload only about four hot table tops when another man would replace the first while he retired to "cool off." It was a man-killing job and the furnace was soon made obsolete, but it had served to demonstrate the practicability of "continuous" firing of porcelain enamel.

In addition to the work described, our company has managed to keep its enameling plant operating on a minimum basis throughout the war to take care of high priority needs for Ordnance and industry. Chemical drying pans, stove parts for field ranges, lantern tops for lanterns that go on every ship in the service, and a dozen and one other products were needed for the war effort.

Sidelight

With the necessary increase in employment at the Nappanee plant and the adding of many new employees unacquainted with the company's ideas and policies we printed a small booklet of explanation and friendly welcome. A few excerpts from this

booklet seem to offer a suitable closing to this "Main Street" war plant story:

"There is something we wish you would do as you join us. Ask yourself 'why' whenever you see anything that doesn't look right. No one person or no one group has all the good ideas. The newest man or woman on the job may have the next new idea, and be responsible for the next step forward . . .

"We don't like to tell you what you can and cannot do. We should much rather tell you what you are doing. You are making ammunition for our soldiers, and as such you play a very important part in the war effort. You are doing your share, and we know you will continue to do it.

"We hope you like us and want to stay with us. At times you are going to think we are swell. There will be other times when no words in the dictionary are bad enough to describe us. Like you, we have our faults and our troubles. We try to make this a good place to work.

"We cannot satisfy everyone—and neither can you. But, if we all try and do even half as well as we really can, this shop will not only be a successful plant, but it will also be a happy plant."

The future of porcelain enameling

By B. T. Sweely • DIRECTOR OF RESEARCH, CHICAGO VITREOUS ENAMEL PRODUCT CO., CICERO, ILL.

This article is based on a talk before the Enamel Division of the American Ceramic Society at its 45th Annual Convention.

THE approach to a discussion of this subject is made with a full realization of the writer's rather limited ability to view the subject as a whole. Nothing could be farther from my purpose than trying to create the impression that I feel competent to analyze or predict the future of our industry. However, out of the past may come some thoughts that are of use in looking at what the future may hold. In this hope I present my views on this subject in which we are all so vitally interested.

Inasmuch as we are primarily interested in the technical end of our industry it might, perhaps, be well to confine ourselves to a discussion of what we can do to improve this phase of porcelain enamel, since we well know any real technical advance in any product is always followed by an enhanced economic value and consequent increased public use. As a corollary, we may be sure if we fail to attain such improvements our relative position at the war's end will become increasingly unfavorable, as competing materials and finishes will be ready and eager to take advantage of any failure on our part to keep step with need of improvement of the materials and processes of our industry.

It seems to me two of the materials of porcelain enameling present a problem that should challenge the interest of every enameler. I refer to the almost age-long question of steel and enamel—and to these I will add a third, shop processing. In connection with enameling defects encountered in production the question of whether steel, enamel or processing is at fault is never settled. Shouldn't we seek a solution of this question? All parties to the controversy recognize their possible responsibility for

these defects—none are in position to prove their innocence. Would it not be well if we could provide a means of telling whether enamel, steel or processing are below standard in order not so much to end the controversy, but for the far more important purpose of overcoming these difficulties in the manufacture of porcelain enameled products?

Porcelain enamels have been improved, but one would be fearless indeed to claim the ultimate has been reached with frits now in use. Greater working range, greater freedom from defects and greater covering power are all needs crying for solution, and these improvements will not be easy to attain. Fundamental research and its application to enamel or frit-making was never more essential to meet the challenge of competition than during this lull in the production and use of porcelain enamel. The leadership for such research must originate with those actively engaged in the industry—there is no other probable source.

The sheet steel we enamel is also essentially our problem. Improvements in the enameling characteristics of sheet steel are as vital to the porcelain enamel industry as improvements in enamels. In just what manner they should be improved is not the question. As gains in sheet quality are attained, decrease in cost of product, a wider field of public acceptance and use of porcelain enameled products will follow with consequent benefit to both sheet producer and enameler.

Shop processing is the enameler's problem, and as such, it becomes essentially a problem for which the industry's technical personnel bears no small responsibility. Cooperative study of the processing of ware in

the enameling plant is extremely important, and I believe has received far less attention from research workers than its importance deserves. While it is true that enamel shops and departments are not operated for laboratory study, I have yet to see the enamel shop that could not benefit by a measure of what constitutes good cleaning, application and firing procedures. A review of our technical literature, correlating all available information into a pamphlet of "Good Practice" might be of real benefit to those responsible for shop operation.

Having called to your attention a sizable collection of problems, what are we going to do about them? While appointment of a committee is not a solution of any problem, I know of no other way for the industry to function without a properly financed research organization to whom we can submit the problems. Later I have a committee suggestion for your consideration that would operate within established organization channels.

to Page 20 →

B. T. Sweely





G. H. McINTYRE — Known to friends and associates as either "Doc" or "Mac" is Director of Research of Ferro Enamel Corporation. During recent months he has been devoting a part of his time to war problems but, according to his associates, he hasn't allowed any dust to gather on his porcelain enamel formulae books.

P. B. McBRIDE — This is a good example of the smile that has many "friends" for "Mac" throughout the enameling industry. His company was one of the early ones to convert to war production. As President of the Porcelain Enamel Institute and Porcelain Enamel Corp., Louisville, Ky., he is active in all industry cooperative work.



PEOPLE YOU KNOW

E. G. WALBRIDGE — The Erie Enameling Co. is one of the industry's jobbing plants that has continued to do enameling work throughout the war. As Sales Manager it has often been "Earl's" job to work with various war agencies and manufacturers for whom Erie has worked out special parts or products in porcelain enamel to fill vital war needs.



L. A. ADAMS — This serious and attentive snapshot (a la candid to be complimentary) is of Chicago Vit's Southern representative. "Lew" lives in St. Louis and travels throughout the South and West. His experience in enameling includes shop management and practical enameling as well as selling.

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MORROW — Vice President of a company that has made a
for itself in the production of shell cases, both brass and
steel. Mullins Mfg. Co., Youngstown Pressed Steel Div., Warren.
"Charlie" is widely known in metal stamping circles and
a production of pressed metal plumbing ware on a big scale.



R. G. CALTON — "Bob" came to Tennessee Enamel Mfg. Co., Nashville, Tenn., not so many years ago from Seeger Refrigerator Co. The fact that he has done a good job in the South is evidenced by his present position as Executive Vice President. He is a Past President of the Porcelain Enamel Institute and a "plunger" for industry cooperation.

N
OR
SHOULD
KNOW

Strictly Candid



H. COIN — "Ray" is the congenial Vice President of Ingram-Chardson Mfg. Co., Frankfort, Indiana — well known frit manufacturers and job enamelers. The company has been 100% on war work, including fabricating and enameling of important items for Uncle Sam. "Ray" has the ability to make friends with customers and competitors alike.

→ from Page 17

We must keep in mind that the manufacturer who uses porcelain enamel on his product has no interest in porcelain enamel as such. His problem is to provide a finish that appeals to and satisfies his customer. In the past he has used porcelain enamel because of its permanence. Competing materials have had most of its other properties for some time, but permanence has been our "hole card." Quite probably our manufacturer has had a good many complaints to register against porcelain enamel. He probably objects to the damage incurred on his assembly lines and in shipments, the delays his production suffers from rejects and rework as well as inability to schedule a definite number of parts and be assured of the production of a definite number of finished products. He is eagerly looking at all times for a simplification of his manufacturing problems, and will welcome the promises of our competitors if they can substantiate their claims.

Fortunately, in the past we have had the only permanent finish available for iron and steel, and it has been comparatively easy to create sufficient dissatisfaction with other finishes to hold a substantial amount of the finishing on these products. To assume this will continue to be the case is inviting disaster.

As a matter of record, I believe a properly financed research organization would be the wisest investment the industry could make. Every company, whether it has one small box furnace or a dozen continuous furnaces, has a vital interest in the improvement of the materials and processes that is producing the parts used on its product. In addition to the enameler and frit manufacturer I would invite the support of our friends of the steel industry, for they, too, face the threat of competition of other metals in our field where steel has been preeminent in the past.

Such a plan of course is utopian and the man capable of rallying to the support of such a project, the divergent interests of our industry, really should not be wasted finding a solution to our troubles — he should

be made chief co-ordinator of our Washington alphabetical agencies and bureaus. Since we can scarcely hope to realize the millennium we had best seek a more feasible attack, and, it seems to me, closer cooperation between the Enamel Division of the American Ceramic Society and the Porcelain Enamel Institute is indicated. It is unfortunate, but nonetheless true, that research costs money. Unless we can secure financial support for an adequate research program most of our discussion is a waste of time, and we will continue our rather impotent attempts "to do something about" a problem that can only be solved by full-time, intensive investigation.

As a somewhat active member of both organizations I can see no conflict between the Porcelain Enamel Institute and the Enamel Division of the American Ceramic Society. Both are vitally interested in furthering the use of porcelain enamel, and consequently should be working in the closest harmony. Primarily the Enamel Division is interested in the

technical phase of the industry, while the Porcelain Enamel Institute devotes itself to the commercial exploitation of our product. For either organization to encroach on the field of the other is economically unsound and a waste of effort.

At recent meetings of the Porcelain Enamel Institute research was given more than a passing glance. A committee has been appointed to see what can be done to promote more activity in this vital phase of the industry. I hope to encourage discussion of the question of Division cooperation with the Institute on a research program. I believe a carefully selected committee should be appointed from each of these organizations to work closely together on the formulation of a research program for the industry. I shall not presume to suggest or advise the phase of porcelain enameling toward which such cooperative effort should be directed, but I am confident there is sufficient ability in these organizations to secure results of great value if properly applied.

Standard designs in porcelain enamel

Stations of this design are located in Buffalo; Pittsburgh; Springfield, Mass., and other cities. This installation is an example of what can be done with porcelain enamel to maintain standard designs. Fluted columns

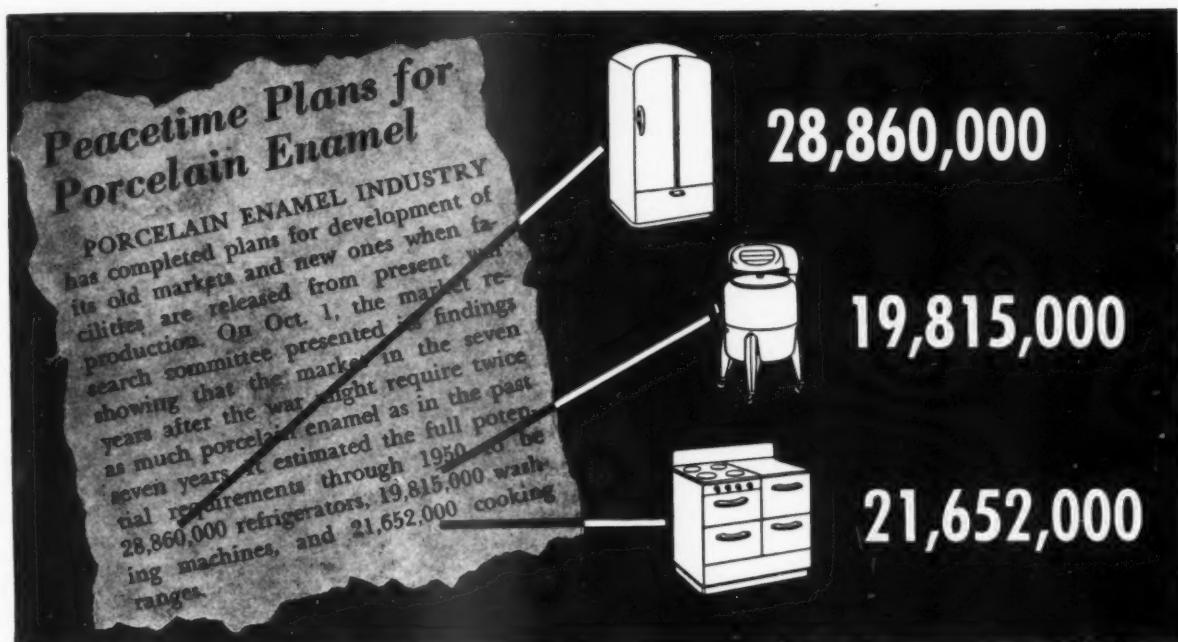
and other standard features are carried out in detail. "The sign of the Flying red horse" is another feature which can be carried out most effectively in porcelain enamel.

Photo courtesy Erie Enameling Co., Erie, Pa.



APRIL • 1944 finish

Plan for BIG Orders



IN MILLIONS of new homes, kitchen, basement and bath are outstanding prospects for porcelain enameled fittings, accessories and panels.

Refrigerators, stoves and washing machines will, of course, be in demand. In addition, porcelain enameled cooking and processing vessels and utensils for homes, office buildings and factories, for hospitals, hotels and institutions, equipment for dental and medical offices, operating rooms and laboratories — all will be needed when you return to open markets.

The qualities which make porcelain enamel the ideal material for so many and varied uses depend for

their permanence upon the metal base to which the frit is applied.

Our metallurgists, working with the technicians of your industry, have produced sheets with ample ductility to take deep, difficult draws, yet provide rigid strength to retain shape under load. U·S·S VITRENAMEL Sheets also have a specially treated surface which enables frit and metal to fuse into such a firm bond that they become practically a solid unit. They lend to the fabricated product strength without excess bulk or weight, resistance to weather and temperature changes, to corrosion and abrasion.

You can plan wisely—now—for

this increased demand for porcelain enameled products. A good way to start is to familiarize yourself with the latest metallurgical improvements, to make sure you have complete and authoritative information on every factor that can affect the quality and cost of your products.

To this end our VITRENAMEL engineers will be glad to consult with you, to contribute their experience as specialists in the field to the discussion of your present problems and plans for future products.

Write us today and we shall be glad to furnish this complete technical service without charge or the slightest obligation, upon request.

U·S·S VITRENAMEL SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York



UNITED STATES STEEL

American Ceramic Society's

46th annual convention

PITTSBURGH was invaded on Sunday, April 2, and the succeeding three days by an army of ceramists which passed the 1270 mark (official registration) by Wednesday morning.

Sunday's schedule included meetings for the A.C.S. Fellows, the Institute of Ceramic Educational Council, the Institute of Ceramic Engineers and Keramos. An interesting lecture, but one that appeared to be a little over the heads of those who were not blessed with a thorough technical training, was that given by Hoyt C. Hottel, Department of Fuel Engineering, M.I.T., on the subject of "Infraray Heating."

Monday was devoted to the War Conference General Session, headlining eight feature speakers:

Major Albert J. Stowe, Military Intelligence, Office of Civilian Defense, Washington, D. C.

James Finney Lincoln, Lincoln Electric Company, Cleveland, Ohio.

I. W. Clark, Westinghouse Better Homes Department, Pittsburgh, Pa.

Robert A. Weaver, Ferro Enamel Corporation, Cleveland, Ohio.

Edward F. Borden, Douglas T. Sterling Company, Stamford, Conn. (This talk presented by E. H. Lehman.)

K. G. Fuller, U. S. Steel Corporation, Pittsburgh, Pa.

J. Gordon Lippincott, Dohner & Lippincott, New York, N. Y.

Edward R. Weidlein, Mellon Institute of Industrial Research, Pittsburgh.

The crowd that jammed the main ball room of the William Penn Hotel to hear these speakers was well rewarded. For porcelain enamelers "Bob" Weaver's talk was very stimulating. A talk that struck home to manufacturers in all phases of the

industry, and was roundly applauded, was that of James Finney Lincoln who, in addition to his talk on wage incentives, gave a candid discussion of Government control in relation to modern business.

Tuesday and Wednesday were devoted to divisional meetings, for which extensive preparation had been made by each division. R. C. Purdy, the Society secretary, the officers and various committee chairmen received congratulations on a well-planned convention, and continued interest in all meetings through the convention affirmed this verbal approval.

Ample entertainment was provided for both the ceramists and ladies in attendance, one of the highlights of which was Monday evening's dinner dance with its elaborate floor show.

Ceramic Camera Club had its usual effective exhibit for the "camera bugs."

The president's address

IN OPENING his address Mr. Bales declared "Ceramic engineers, ceramic manufacturers, and The American Ceramic Society have all had a vital role in the war . . . You may all be proud of the extra work you have done and of the production records you have broken. You may also be proud of the fact that many of your war developments will have great postwar usefulness."

While there seems little possibility of a bright outlook for the Student Branches until the war is won, the retiring president is convinced that the Local Sections have a wonderful opportunity at the present time.

"The Local Sections are invaluable to those members who are unable, for one reason or another, to attend our Annual Meetings . . . One new Local Section was organized this year—the Up-State New York Section."

Mr. Bales pointed with pride to the activities of the Public Relations

Committee, under the chairmanship of V. V. Kelsey, which has been successful in gaining recognition by the Selective Service System for ceramic engineers and technologists.

In his address Mr. Bales raised the question, "What will the Society face when the war is ended? Will there be a terrific postwar depression or will there be a period of unprecedented prosperity?" . . . "my guess," said Mr. Bales, "is that there will be neither . . .

"It is reasonable to believe that business will be maintained on a fairly high level, either naturally or by governmental stimulation. We will have high wages, high prices, and high taxes for several years to come. Corporate profits, however, may be very meager. Competition between products and competition between members of the same industry may be intensely keen . . .

". . . In order to maintain their position, manufacturers of all types

of ceramic products will carry out extended programs of research and development. Old established products will be improved in workmanship and quality and many new products will be developed. This will mean a greater demand for ceramic engineers and technologists and a greater demand for services from The American Ceramic Society . . .

"We should continue and enlarge on our cooperation to the universities in developing stronger ceramic curricula, developing stronger Student Branches, and encouraging fundamental research . . .

"Yes, The American Ceramic Society has been, and will continue to be, of great service to industry, to its members, and to the nation. It will continue to grow in power and prestige, and the rate of growth will depend on what each individual member is willing to do."

War Conference general session

second wartime meeting

Security of military information

By MAJOR ALBERT J. STOWE, G.S.C.

"My mission here is to emphasize the importance of curbing LOOSE TALK in a nation at war; among a people intent upon early and decisive victory.

"We are pursuing a vast program for this specific purpose. Many aspects of the program are national in their application. Other features are dependent for success upon the aggressive but sustained effort of local civilian leadership in numerous communities throughout the country.

"As all of you are in position to further the program, and because you are also a typical cross-section of relatives of loved ones in military and naval service, anxious for the ultimate return of those who are precious to you and your neighbors, it is highly important to have you familiar with the seriousness of the problem and why we must teach everyone the need of caution in conversation re-

garding military matters. . . .

"Military censorship exists for the very specific purpose of safeguarding the effectiveness of SECRECY and SURPRISE in our military operations; not to keep you from receiving "don't worry" messages from relatives. The institution of Censorship maintained at great cost is not set up as a game to be beaten. There is nothing clever or cute in efforts to evolve kid codes to evade the spirit of censorship designed to keep hazard from the paths of those you love, to speed the final decisive victory and return those for whom you yearn incessantly. Regardless of how full of censor's deletions your letters may be, it is well to always consider those letters as privileged communications to be treated accordingly. . . .

"A thousand careless talkers, each with some atomic and apparently negligible bit of information concerning

the plans, may furnish Berlin with the pieces of the jigsaw puzzle that it needs to round out the invasion picture and prepare for the assault.

". . . Loose talk can place large Axis forces at the points of penetration at the hour of invasion. It can delay the end of the war. It can even bar a decisive victory for our side. The necessity for silence never was more acute than it is now and will be during the months ahead.

"I'm not going to try to end my talk with a dramatic punch-line. I'm simply going to ask you to think over what I've said to you today. To talk it over with your family and friends when you leave this hall; when you go back home. And to highly resolve right here and now, that you are going to do your best to help solve this problem of careless talk."

Wage incentives—Government controls

By JAMES FINNEY LINCOLN

Mr. Lincoln has won nation-wide attention in connection with his labor policies and the wage incentive system of his Lincoln Electric Company in Cleveland. Whether his system is right or wrong would certainly not be within the province of this publication to decide. One point is certainly clear, and that is that after practicing his present policies over several years he is convinced of their soundness. In addition, he has the personality and delivery to put over his points in a convincing manner.

In a section of his talk which candidly expressed opinions on government regulations he said that his company had paid to the Treasury \$1,600,000 which he considered was "for paying labor too much in spite

of the fact that the company's labor cost was approximately one-half of some competitors." He explained this in the fact that "bureaucracy" must go by rules. "I believe the question to settle is what is going to be the position of the individual and his government. Government can be the servant of the citizen, or the master. If it is the master it will be the same as others—totalitarian."

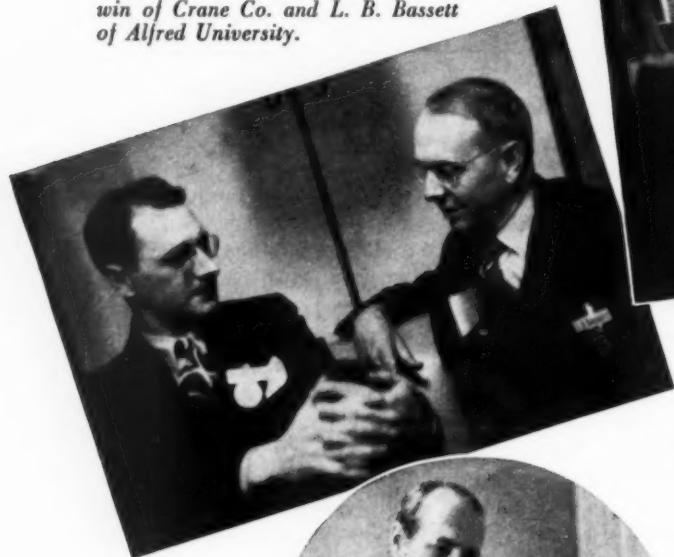
He pointed to American industry as the greatest industrial development in the world. United States, with its population of 131,000,000 serves as the arsenal of the world, including such countries as Russia with a population of 192,000,000, China with 457,000,000 population and Great Britain with 47,000,000 popu-

lation. "This didn't just happen. The individual has been free to rise to any point his ability warrants. This is not possible in other countries."

There is danger of industry coming out of the war picture without proper financial stability to carry on independently, and under present regulations companies will not have the proper backlog of assets after the war is over. In connection with the evolution of various governments "history shows that every nation started out to have liberty—where liberty was lost it was swept away by their own governments in every case.

"Many people think of liberty as a birthright—liberty never comes as a gift. It must be purchased . . ."

Right: Ferro's Hansen and Whitesell of Rohm & Haas. Below: W. J. Baldwin of Crane Co. and L. B. Bassett of Alfred University.

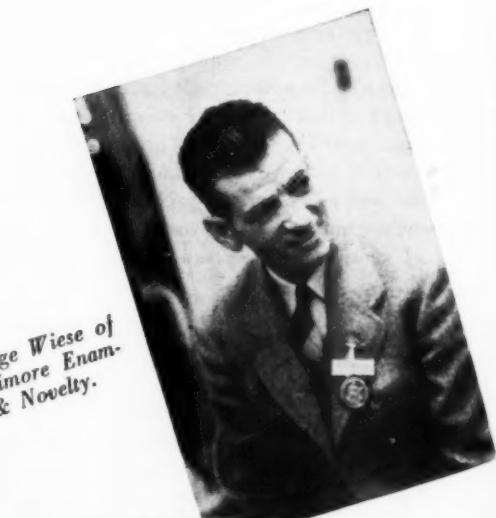


Circle: McGean Chemical's Ralph McGean places a call.



Above: Dykstra of Great Lakes Steel and Hoehl of Wolverine Porcelain. Circle: McDonald of Ing-Rich.

George Wiese of Baltimore Enamel & Novelty.



Circle: Schabacker of Erie Enameling.



Republic Steel metallurgists — J. M. Volzer and J. H. Crowe.

THE A.C.S. CONVENTION

Arnold of Federal Enameling and Roth of Rundle, Camden.



Above: Charlie Wulf of American Valve and Enameling. Below: G. E.'s Eddie Eckels.



Circle: Karl Kautz of Climax Molybdenum.



Postwar housing relationship to industry

By I. W. CLARK

In his talk Mr. Clark pictures unusual possibilities for industry in the post-war period as a result of a pent-up need that is steadily gaining in magnitude. "Over 1,000,000 new homes and new housing units will be required annually for the next ten years, which compares with an average of only 350,000 during the last ten years."

He showed how this might be reflected in dollars to industry—based his calculations on 1940 dollars, with his prediction to start after both Germany and Japan are out of the war. He believes the success of each individual branch of industry in the post-war housing picture will depend upon the promotion of its product and close cooperation with the con-

struction industry.

In covering the room ensemble idea he pointed to the fact that thousands of complete electric kitchens are now in use, and voiced the opinion that the ensemble plan can also be adapted to the bath, the laundry, the utility room, etc., with proper study and adequate promotion. Furthermore, 1942 products should be anticipated for post-war—possibly in new dress. Distribution is also expected to be through the same standard channels. Changes must be evolutionary. "Only partial use has been made of techniques of 1941, and the public accepts innovations slowly—education is necessary."

It is believed some of the problems in the building field should be

met by furnishing a complete housing unit with considerations for economy, location, low upkeep, etc.—"a series of living packages—that can be merchandised to various income brackets." This would offer a real competitor for consumer dollars.

"Industry cooperation is the important problem. The time for such cooperation is now and, as a matter of fact, is far too short." A cooperative effort must include the builder, architect, city planning administrations, financiers, utilities, manufacturers, government agencies and all others who form a part of the complete building picture. Proper co-ordination will require strong leadership in every community.

Porcelain enamel in postwar enamel industry

By R. A. WEAVER

Mr. Weaver covered briefly the historic phase of enameling as it was used for decorative and protective purposes. He outlined the reasons for using finishes on the "less expensive" metals as follows: (1) to improve corrosion resistance, (2) to improve wearing properties and (3) to improve appearance.

The talk encompassed the electro deposition of metals, metal coatings by immersion, the conversion of metal surfaces, sprayed metal, cementation, cladding, organic coatings and last, but not least, porcelain enamel. It was shown how the war has boosted the surface conversion processes tremendously.

"Because of the low temperatures required, organic finishes are suitable in some places where porcelain enamel can not be used. However,

they are soft in comparison, and our company, which makes both the synthetic and the real, generally speaking, doesn't consider them competitive.

The possibility of competition for porcelain enameled steel from aluminum, stainless steel, plastics and other competitive products was not discounted. They all have their place and their possibilities. A touch of humor was added with the statement: "Feature writers say that automobiles, bathtubs, houses—everything—will be made of plastics after the war—but they don't say *which* war."

In fairness to the manufacturers of plastic products it was explained that they are not in sympathy with many of the wild claims that have been made for their products, and

are concerned about protecting their industry by having their materials used only where they are suitable.

In a bit of prophecy for the future market for porcelain enamel Mr. Weaver said, "In my opinion the porcelain enameling industry which gets its volume from the refrigerator, bathtub, washing machine, range and kindred industries has, I believe, nothing to fear from the finishes we have discussed or the new materials which have been ballyhooed so much in the past few years—IF—if we do the job that is so clearly outlined for us to do."

Mr. Weaver then outlined the current progress in connection with the research activities of individual companies and cooperative groups, and stressed the importance of this phase of industry activity.

Ceramic problems and application of wage incentive methods

By EDWARD F. BORDEN

"A properly devised incentive plan can be tailor-made to fit any organization, provided that four distinct and basic premises are included in the overall program. A wage incentive plan is intended to:

1. Increase production.
2. Reduce cost and establish basic cost information.
3. Increase employees' earnings.
4. Improve labor relations and morale.

"Wage incentive plans cannot be considered in a casual, a careless or in any other hit-or-miss fashion when a program of wage incentive is started . . ."

Wage incentives must come from

a concept of labor relations. Labor knows they can increase their "take" through incentive systems . . . but . . . they are often fearful of later cuts in rates. This is serious and rate cutting a mistake.

Careful studies and improvements are required before installing incentives—not after.

"When the standards are once es-

tablished, they should be established for good—with no change in the standard unless there is a change in the method . . . This should be clearly understood by both workmen and management and incorporated in labor agreements."

Company records and simplified statistical information are important in the proper functioning of a plan.

" . . . Wage incentives properly installed should reduce costs, should make a better marketing situation from the standpoint of price, and should actually increase the sales opportunities of the company and, therefore, maintain the opportunity for work for all involved."

Chemistry in defense and recovery

By EDWARD R. WEIDLEIN

tween scientist, research worker—industrialist.

We can easily visualize the weak position America would be in today if it were not for the extensive researches and developments of the past twenty-five years.

Research and developments have not only made many war materials available in the quantities required, but have greatly reduced war production costs. The petroleum industry represents an outstanding example of research activity; radar is a good example in the field of electronics; tolulene and ammonia work has been extremely important to explosives; textile producers have been active; synthetic rubber is another example.

"The pressure of this war is compressing within the space of a few months the realization of developments that might have taken half a century to attain had it not been for the forced pace and teamwork. . . ."

"Flash of Genius" is exceedingly important but comprehensive, lengthy research is likewise a necessity.

Millions in the armed forces will return to civilian life with a better understanding of the importance of research and industrial development. "Like scientists, they will know that new frontiers must be faced with as little handicap as possible."

Industry prepares for peace

By K. G. FULLER

The first part of Mr. Fuller's presentation consisted of an interesting movie which is about to be released by the "March of Time" in connection with "post-war jobs." While we will not attempt to outline the movie in detail, it might be mentioned that it covered, among other things, the millions of products such as refrigerators, and homes which it is expected will be manufactured and built within the first five or ten years after the war.

Following the showing of the movie Mr. Fuller outlined some of the work that is being done by the Committee for Economic Development, and other similar developments, in the field of post-war activity in preparation for peace.

Three classes of job problems were covered—(1) job problems which are nationwide, (2) those which are localized within metropolitan centers

and (3) job problems which are faced by individual companies. The C.E.D. movement has the country divided into twelve regions—each region headed by a top-notch business man. It is then broken up into individual boards and Field Development Committees. The work of the Field Development Committees is to influence individual communities and individual companies to plan ahead.

National research committee

The National Research Committee is working on problems for the country as a whole, such as problems of taxation, disposal of government-owned plants, government-owned surpluses, etc. "They are particularly interested in problems of the small business because the backbone of our country is made up of small business, and if the C.E.D. can help the

small business, it will be one of the most important jobs."

The individual business man can do little about the major problems just outlined, but he can make plans for his own company in the light of the trends which are indicated.

One thing to think about is the changing habits of people resulting from the millions in service overseas and migrating population.

"I would urge that in your own consideration of plans for peace you delve as carefully as you can into the data that is available in your organization, in your own American Ceramic Society, and gather all the facts that you can together; and I think with this type of approach, using facts rather than hopes and wishes, that you will also be able to do a better job when peace comes."

to Page 48 →



Above: Roger Fellows of Chicago Vit. and Mrs. Fellows. Right: National Enameling's Foehse and Dexheimer.

Center: Swoe of Ferro; O'Bannon of Battelle Institute and McCann of Pjaudler, Rochester. Circle: Roy Beck of Westinghouse, Mansfield.

Bottom left: O. Hommel's Marbaker and Cook take it easy. Right: Glen Hutt, formerly with Ferro, now with Chemical Warfare, Pittsburgh—and Mrs. Jack Hunt.



Enamel division program

American Ceramic Society—46th annual meeting

Attendance was excellent at the meetings of the Enamel Division and interest continued throughout the program which speaks well for the planning of the Program Committee headed by H. D. Carter, The Harshaw Chemical Co., Cleveland, Ohio, and the capable chairmanship of D. G. Bennett, University of Illinois, Urbana, Ill. The secretary of the Division is D. G. Moore, National Bureau of Standards, Washington, D.C.



H. D. Carter, Program Chairman

New Division officers elected for the ensuing year were: H. D. Carter, chairman; W. W. Higgins, A. O. Smith Corp., Milwaukee, Wis., vice chairman (in charge of program); and D. G. Moore who was re-elected secretary.

Aside from the many excellent papers the program included consideration of standard tests applicable to the Enamel Division. The Symposium on Tests, presented by R. L. Cook,

Dept. of Ceramic Engineering, University of Illinois, chairman of the Enamel Division Standards Committee, covered the following:

Metal and pickling tests — Mr. Higgins.

Responsible for program



D. G. Bennett, Division Chairman

Slip properties (fineness tests, etc.) — C. M. Andrews, U. of I.

Abrasion and similar tests — F. A. Petersen, U. of I.

Frit properties (fusion, viscosity, surface tension, etc.) — Mr. Cook.

Five tests which are already considered as standard by other organizations were presented for approval. They are as follows:

1/ Reflectance test — P.E.I. standard.

2/ Tests for acid resistance (flat ware) — P.E.I. standard.

3/ Test for resistance to gouging — P.E.I. standard.

4/ Impact test for utensils —

E.U.M.C. standard.

5/ Solubility test — E.U.M.C. standard.

The Division voted to recommend to the Committee on Standards of the A.C.S. that numbers 1 and 2 be adopted as standard tests, and numbers 3, 4, and 5 be adopted as tentative standards. (This recommendation was later acted upon by the Committee on Standards and approved by the Board of Trustees.)

Mr. Moore read a report by G. H.



D. G. Moore, Division Secretary

McIntyre, Ferro Enamel Corporation, Cleveland, Ohio, on the work of the Enamel Division Committee on nomenclature. Question was raised on the use of such words as "non-metallic," "in-organic," etc., but no action was taken.

Following the handling of other items of general business, Chairman Bennett opened the program of formal papers which are covered by the following abstracts:

Mechanics of enamel adherence and influence of manganese

dioxide upon metal precipitation at the ground coat interface

By R. M. KING

Using a previously developed electrical resistance method the influence of manganese dioxide upon metal precipitation in fixed ground coats

was determined. Bernard, a French Chemist, found that the addition of CoO to FeO and NiO to FeO increased the temperature at which

metal was precipitated from FeO alone. He also found that MnO prevented the precipitation of metal from FeO.

Previous work by the author has indicated that the action of cobalt and nickel oxides in fired ground coats is in harmony with the work of Bernard. Some statements in the enamel literature indicate that manganese dioxide aids the adherence of ground coats as much as cobalt and nickel oxides. Others indicate that this is not true.

The results of tests reported in this paper indicate that when manganese dioxide only is added to



R. M. King

ground coats no metal is precipitated. Hence, it does not have the same influence as cobalt and nickel oxides. Data obtained on ground coats which contained manganese dioxide, cobalt oxide and nickel oxide were so erratic that they are not considered significant. Hence, any conclusions as to the indirect influence of manganese dioxide are not warranted.

Results on manganese dioxide are in harmony with the work of Bernard.

Abrasion resistance of porcelain enamels

By CLARK HUTCHISON

Abrasion resistances of 16 commercial enamels differing in composition and properties were measured by the test for resistance of porcelain enamels to surface abrasion—a standard of the Porcelain Enamel Institute, March 1942—also, to get some idea of the effect of composition changes on abrasion resistance, the silica content was progressively decreased in a base frit.

The abrasion test consists essentially of (one) reading specular gloss; (two) subjecting specimens to a controlled abrasive treatment; (three) again reading specular gloss. The percent gloss retained is the abrasion index or the measure of abrasion resistance. The time of test is determined by the time necessary

to reduce the gloss of standard glass plates by 50%. The average of the abrasion indices of six plates constitutes one sample determination.

Four or five classes of abrasion resistance were obtained with the commercial enamels. Lack of test data correlated with experience makes it difficult to judge the importance of these differences in results, although a large difference in abrasion resistance was indicated between the best and poorest enamels—for the most part results seemed to fall within a relatively narrow range.

No one type or class of enamel seems superior to others. None of the known enamel properties offer any clue for predicting results with possible exception of specular gloss. In general with a given group of enamels those lowest in specular gloss gave highest abrasion resistance, although this was not true in all cases.

While changes in frit formula affected abrasion resistance, apparently comparable results may be obtained with many compositions and combinations of properties.

In an attempt to evaluate differences in test results, visual ratings of abrasion resistance were made by two persons according to loss of eye appeal. While the agreement between the two visual ratings were not entirely consistent there was even less agreement with test results; whites were consistently picked as showing the least damage while the

Clark Hutchison



R. L. Cook



Chemical durability of porcelain enamels

By R. L. COOK

The resistance of representative porcelain enamel surfaces to the chemical attack of different concentrations of various solutions was investigated in considerable detail. Cylindrical cup-shaped, commercially drawn samples were coated with the following enamels: ground coat, white fluoride cover, white antimony cover, white zirconium cover, acid-resistant white cover, sign blue cover, blue zirconium, commercial acid-resistant blue cover, and a commercial acid-proof blue cover.

The loss in weight of the various enamel surfaces after exposure to chemical attack was measured at selected time intervals. The inorganic acids consisted of hydrochloric, nitric, sulphuric, phosphoric. The organic acids included acetic, citric, tartaric and lactic, pyrogallic and others; also 10% solution of sodium hydroxide and various selected salts.

Summary of results and conclusions

The determination of the loss in weight per unit surface area is a very satisfactory means of studying the chemical attack of inorganic and

organic acids, the alkalies and to a lesser extent the salt solutions at both room temperature and at boiling temperature.

In general, non A.R. enamel surfaces are quite resistant to attack at room temperatures by concentrated H_2SO_4 and concentrated H_3PO_4 , while conc. HNO_3 shows some attack and conc. HCl an appreciable amount of attack.

The 10% and 20% acid concentrations show about the same rapid attack on most non A.R. finishes at room temperature.

A 10% solution on standing in contact with the non A.R. enamels at room temperature show moderately rapid attack for the first ten hours, and then only slightly further attack. If fresh solutions of the same concentration are used at each time interval the degree of attack is markedly increased.

Even a two frit ground coat enamel is as resistant or more resistant to acid attack than the other non-acid-resistant enamels.

Porcelain enamels are quite resistant to the chemical attack of the

alkalies and the selected salts at room temperature.

At boiling temperatures the acid resistant white cover enamel is attacked to the greatest degree by the mineral acids (sulphuric, hydrochloric and nitric) to a slightly less extent by oxalic acid, to an intermediate degree by citric, tartaric, malic and lactic acids while acetic, pyrogallic and carbolic acids show comparative-ly low attack.

The attack of acid solutions at boiling temperatures on the acid resistant white cover enamel is about three times as great as the attack on the commercial acid proof enamel.

From the study of the boiling salt solutions, it is evident that the action of the salt solutions on the various enamel surfaces is quite specific. In general, salts which hydrolyze alkaline show a greater attack on the acid resistant and acid proof enamels and a varied amount of attack on the non-A.R. surfaces. The salts which give an acid reaction on hydrolysis show only slight attack on the acid resistant and acid proof surfaces.

General properties of clays and enamel slips

By BURNHAM W. KING, JR., H. D. CARTER AND H. C. DRAKER

This paper is an investigation of the properties of five typical enamel-clay and their action when milled with various types of enamel frits. The data obtained on the clays included the following: crystal form, particle size, pH when titrated with $NaOH$, carbon content, and weight loss on heating. The enamel slips were compared as to the pick-up for different clay combinations at specific gravities of 1.65 and 1.75, and after aging from zero to 48 hours. The pick-up weight was found by dipping a plaque in the enamel slip, allowing it to drain, drying, and then weighing to determine the amount of dried enamel retained.

The clays were found to contain kaolinite, quartz and some illite. There was some variation as to the

particle size of these clays, but even the coarsest contained at least 75% of material less than 2.0 microns in

Burnham W. King, Jr.



diameter. For this group of clays, the pick-up weight was most closely related to initial electrolyte content of the clays as shown by the data on pH. The opacity of the clays when fired in enamels was approximately proportional to the total carbon content. The frits used in making the pick-up tests included three ground coats, an ordinary opaque antimony cover coat, a clear enamel with class A acid resistance, and an antimony free enamel. Considerable variation in pick-up was noted with the different compositions. It was also shown that when blending clays or slips of different specific gravities, the slip produced will usually have a lower pick-up than the average of the initial values for the two things mixed.

Enamelled utensil manufacturers' council standard thermal shock test for porcelain enamel utensils

By F. A. PETERSEN AND A. I. ANDREWS

Some factors which influence thermal shock resistance of enamelled ware were discussed.

The equipment and test method used in testing porcelain enamelled utensils for thermal shock resistance by the E.U.M.C. method were described. Test results indicated that increased enamel thickness and decreased metal thickness decreased the thermal shock resistance of the ware tested.

A discussion of the mechanics of thermal shock failures was also given in which the authors propose that thermal shock failures are actually failures caused by the bending of the pan bottom during heating and cooling.

Various data which were found in the literature were applied to show that they fitted the theory advanced. This failure due to bending can account for the decreased resistance to

thermal shock due to heavier enamel coatings, thinner metal shapes and higher co-efficients of expansion of the cover coat enamel. The standard thermal shock method which was presented was shown to be capable of classifying thermal shock resistance of the different types of enamel ware; that is, one, two and three coat. The classification is also arrived at within each of the above groups.

Relation of metal thickness and enamel thickness to impact resistance of porcelain enamelled utensils

By F. A. PETERSEN AND A. I. ANDREWS

Three series of standard two coat pudding pans of different metal thicknesses coated with one, two and three coats of enamel were tested for impact resistance using the Enamelled Utensils Manufacturers' Council Standard Impact Test. It was noted that the impact resistance of the pans was increased with increase in metal thickness of the pans and also was increased with increase of enamel thickness.

It was pointed out that this effect of increased impact resistance with increased enamel thickness is brought out in this test where the impact test is run on the radius of the pan. Since the pan is a rigid shape some advantage can be obtained by apply-



Professor Andrews

ing carefully controlled thicknesses of enamel which may be slightly greater than are used in regular flatware enamel. It must be remembered that this cannot be done on shapes such as stove panels or tops, or other non-rigid shapes which may be distorted by bending or twisting since in the last mentioned case increased thicknesses of enamel would cause a decreased resistance to chipping. The literature concerning fracture of enamels and glazes was carefully reviewed and a discussion of chipping of enamels due to impact and spontaneous chipping, and the effects of various physical properties of the enamel and the design of the ware upon chipping were also given.

The relation of the bottom radius to impact resistance of porcelain enamel utensils

By F. A. PETERSEN AND A. I. ANDREWS

Two series of enamelled utensils were tested for impact resistance using the Enamelled Utensils Manufacturers' Council Standard Impact Test. These two series of enamelled utensils were prepared under regular commercial conditions according to accepted commercial practice.

One group of pans was coated with a gray mottled enamel and the other group of pans was coated with a blue speckled enamel. In each of the tests

the metal thickness was constant within each group and the enamel thickness was kept within close limits. Since these variables were controlled as closely as possible, the effect of the bottom radius of the pans could be studied. The first series of pans, those coated with the gray mottled enamel had a base metal of 28 gauge. The bottom radius varied from 5/16 to 7/8 inch. In the case of the second group of pans tested, the metal gauge

was 24 and the bottom radius varied from 1/4 to 1-1/4 inches.

In both series the impact resistance was increased progressively as the bottom radius of the pans increased. This points out that it is highly desirable that the bottom radii of enamelled utensils be made as large as feasible so as to improve the impact resistance of utensils.

The ceramic engineer and porcelain enameling plants

By C. S. PEARCE

The number one job of American industry today is the development of methods to secure adequate employment of the nation's working force in post-war years. This problem will engage the best thinking of management groups for a long time after the war. It is the only immediate serious problem facing the porcelain enameling industry.

From 1923 to 1933 the ceramic engineer was not effectively used in porcelain enameling plants; in fact, he was considered to be somewhat of a luxury, and well managed plants did not feel the need of his services. There was a long struggle to build up the professional standing of this group with the men who controlled and operated the porcelain enameling industry at that time.

From 1933 to 1943 ceramic engineers came back into employment in

many of the plants and their usefulness was well established, especially for laboratory and research work. By the end of the pre-war period the ceramic engineer was established as the recognized laboratory director and was rapidly becoming accepted as the proper individual to control the processing in many well regulated plants.

It appears that in the period from 1943 to 1953 the demand for ceramic engineers in this industry will be very large. The Market Research Committee of the Porcelain Enamel Institute has already shown that there exists a potential demand for 69,000,000 units in the three major appliance items to be made in the six or seven years which follow the war. This large volume can only be handled by very efficient usage of present manufacturing facilities.

On top of this extensive present demand will be built the huge demand created by new products.

In face of this the supply of ceramic engineers is dwindling very rapidly and, of course, no new engineers are being trained at this time.

It is quite possible that by 1953 we will see the ceramic engineer firmly established as the major operating executive in the porcelain enameling industry.

The future use of porcelain enamel is extremely bright. The volume, of course, demanded to properly rehouse the American public will push this industry to volumes which have never before been anticipated. The ceramic engineer has an important part in this development and must be recognized as the proper professional man to direct its course.

Raw materials for porcelain enamels — a survey of current markets and allocations

By J. W. ILIFF

The restrictions that conversion, steel, and manpower have put on the production of porcelain enameling have made it easy for the chemical supplier to meet the requirements of the frit producer and enameling companies. However, raw materials can be a bottleneck and need to be watched.

First in importance are mill additions which everyone in production uses regularly. Tin oxide may not be used, (WPB Order M43) but zirconium opacifiers and others can be. These products have been available in quantity adequate for the demand.

Color oxides pose some problems. Blacks, which are based upon chrome

are not free; and reds, oranges, and yellows, which are based upon cadmium are difficult to buy because the color manufacturer is limited by restrictions on cadmium.

Nickel salts are being allocated by the War Production Board for enameling. Orders should be filed with the supplier a month ahead of time with full descriptive end use, contract number, and preference rating.

Smelt chemicals have eased greatly. Antimony oxide is entirely off allocation, as is Cobalt oxide. The allocation procedure on cryolite and alumina hydrate has been simplified, it only being necessary for the supplier to ship against orders which

have been approved by the War Production Board. Fluorides in general are easy, although there are still occasional shortages.

Titanium oxide and rutile are scarce and may offer problems since they are required for acid resisting enamel.

All purchasers should keep in mind general priorities regulation No. 1. This order is designed to assure a full supply of raw materials for war plants, and secondarily, a supply equally distributed to all. One of the requirements is that inventories be maintained at a minimum working level. Therefore, purchasing against current requirements is advisable.

Uverite — a mill addition opacifier for porcelain enamel

By J. W. ILIFF

Uverite is the name for an antimony titanium opacifier having approximately the formula 1 mol. calcium fluo-antimonate, 3 mols. calcium titanate. The composition and

production are carefully controlled to secure peak opacity. The Uverite as currently produced was checked against tin oxide in a range of commercial frits. In all cases Uverite had

more opacity than tin oxide. This was shown by charts showing Uverite in clear, opaque, super-opaque, and zircon enamels.

This opacifier was also checked

against tin oxide for color of the resultant enamel; and it was found the colors are the same.

Uverite was also checked for workability — for flow, gloss surface

hardness, and set; and was found to be fully comparable to tin oxide.

The solubility of enamels opacified with this material was compared with those opacified with tin oxide, and it

was found that both the total solubility and the antimony solubility were approximately the same.

Observations indicating absence of plastic flow in sheet iron ground coat

By W. G. MARTIN AND F. W. LAUCK

Prompted by accounts of the plastic flow of glass, the authors wanted to ascertain whether or not glass on steel would undergo plastic flow by virtue of the compressive stresses which are known to exist in glass on steel.

Thin steel rings cut from seamless tubing were glass coated on the outside and others were fired without glass applied to the surface, the firing cycles being the same in both cases. Some rings were cut immedi-

ately after glass coating, while others were cut 2 years later. The contraction of these rings cut with and without aging was the same and therefore, it was concluded that the stresses in the glass remain unchanged and hence, there had been no plastic flow.

By comparing the amount of expansion of the rings fired without glass to the contraction of the glass coated rings, and with the use of suitable formulae, it was possible to

calculate the amount of stress in the glass. The compressive stresses were found to be of the general order of 10,000 p.s.i.

No definite explanation is advanced for the absence of plastic flow under this stress. It is suggested that the cross-sectional dimensions of the glass and the relatively large surface area may account for other forces which restrain plastic flow.

Tests for hot water resistance of tank enamels

By W. N. HARRISON AND D. G. MOORE

80 lbs. per sq. in.

The correlation of the two tests was found to be good when comparisons were confined to loss of gloss and only then when short treatment time in the modified autoclave was considered. After longer periods of treatment the correlation between the two tests broke down. The reason for this breakdown in correlation was ascribed to differences in the resistance of the surface and of the underlying enamel.

One of the test conditions in the modified autoclave (212°F and 80 p.s.i. air pressure) was such as to cause severe pitting of a galvanized iron specimen cut from a tank after 400 hrs. The poorest enamel tested

show rusting after 800 hrs. The best of the tank enamels showed no rusting after 4000 hrs.

In conclusion it was stated that while the 7 day loss of gloss test with boiling distilled water had certain drawbacks, it is by far the best test available for the purpose. Inasmuch as perfect coverage of the base metal by the enamel was adjudged to be one of the most important considerations at this stage in the development of the enamel tank, it was believed that the loss-of-gloss test which separates the very poor enamels from the others is at this time satisfactory for the purpose intended.

Effect of ground coat enamels on reflectance of cover coat enamels

By P. C. STUFFT

The problem of color variation in white cover coat enamels has received considerable attention. However, variation in color due to base coat has received little or no consideration.

An attempt was made to determine the effect of the base coat by comparing color variations in opaque and super opaque enamels applied

over blue, white, gray, red, yellow and green base coats in weights ranging from 10 to 100 grams per sq. ft.

The resultant finishes were compared visually and with the aid of the Hunter Multipurpose Reflectometer. Over the entire range studied it was found that the color characteristics of the finish coat is markedly

affected by the base coat. Especially is this true in the lower ranges of application including normal production application weights. It was found that base coats which decreased the reflectance of the cover coat in the blue field, gave higher apparent opacity than those which maintained a relatively high blue reflectance.

Use of potassium dichromate in determining iron content of pickle acids

By E. G. PORST

Potassium permanganate has been used for many years to determine iron in sulfuric acid pickling solutions. Potassium dichromate has also been used for various iron analyses as evidenced by the considerable number of publications to date on this subject; however, its advantages over the permanganate method apparently have not been recognized by the enameling industry.

A standard solution of potassium dichromate (1) may be prepared by dissolving 44.1 grams of the salt in distilled water, filtering, and making up to 1 liter. For standardization of the solution the following reagents are required:

1. 25 percent sulfuric acid (25% C.P. H_2SO_4 sp. gr. 1.84—75% distilled H_2O by volume)
2. Phosphoric-sulfuric acid solution ($\frac{1}{3}$ C.P. H_2SO_4 sp. gr. 1.84— $\frac{2}{3}$ C.P. phosphoric acid 1.71 sp. gr. by volume)
3. Diphenylamine indicator (dissolve 1 g. diphenylamine salt in 100 ml. C.P. H_2SO_4 sp. gr. 1.84)
4. C. P. Ferrous ammonium sulfate (99.8% purity)

To a 400 ml. beaker add 7.000 grams of ferrous ammonium sulfate, 75 ml. distilled water, and 10 ml. of



E. G. Porst

25% sulfuric acid mixture. When solution of salt is complete, add 15 ml. phosphoric-sulfuric acid mixture, 3 drops diphenylamine indicator, and titrate with the potassium dichromate solution until a deep purple color persists. The normality of the solution may be calculated by formula:

$$\frac{7,000 \text{ (g. ferrous ammon. sulf.)}}{\text{ml. } K_2Cr_2O_7 \text{ sol. tit.} \times 39.215} = \text{normality}$$

The Fe content of sulfuric acid pickling solutions may be determined as follows:

Transfer 10 ml. of the pickle solution to a 400 ml. beaker, add 75 ml. distilled water, 15 ml. phosphoric-sulfuric acid mixture, and 3 drops diphenylamine indicator. Titrate with the standardized $K_2Cr_2O_7$ solution until a deep color persists. The "Fe" content may be calculated from formula:

$$\text{ml. } K_2Cr_2O_7 \times \text{Normality} \times 0.5584 = \% \text{ Fe}$$

The potassium dichromate method for iron in pickle solutions is superior to the permanganate method because the solution is easier to prepare and standardize, it possesses greater stability during storage, (2) it may be used for iron in muriatic acid pickle solutions (3) without radical changes in the method, and it doesn't stain equipment such as burettes, like permanganate.

- (1) *Analytical Chemistry, Vol. 2, Treadwell and Hall, p. 578.*
- (2) "Stability of Tenth Normal Potassium Dichromate Volumetric Solution," *Journal American Pharm. Association, 16, 115 (1927) W. M. Carey.*
- (3) *Scott's Standard Methods of Chemical Analysis, 5th Ed. Vol. 1, p. 471.*

In compliance with the publication policy of the American Ceramic Society, finish offers abstracts covering all of the papers in the Enamel Division program. Complete papers will be available in the *Journal of the A.C.S.*, *The A.C.S. Bulletin*, and other industry publications following their official release by the Society.

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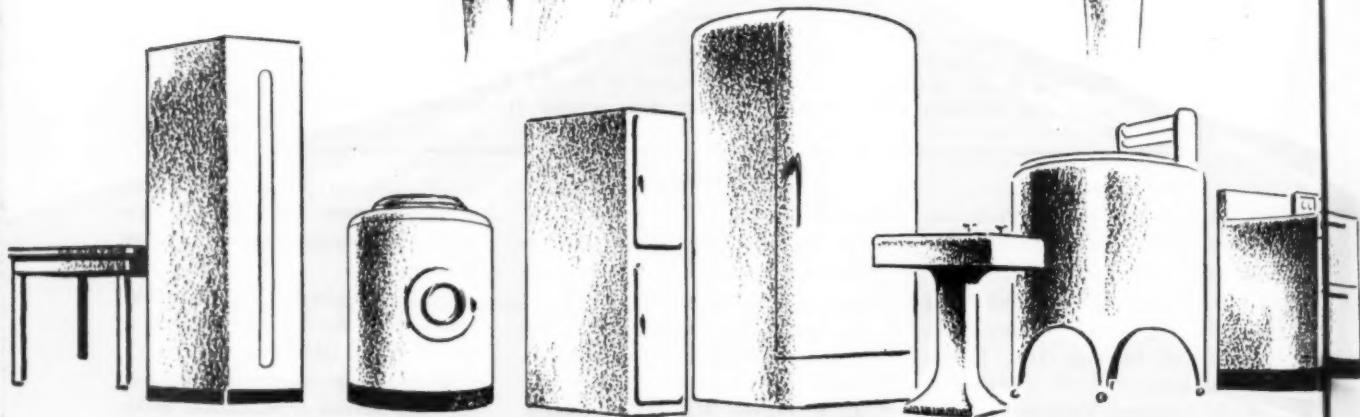
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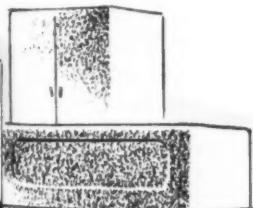
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Right today, CHICAGO VIT men are working with scores of firms—helping them plan their post-war products or assisting them in laying out their step-by-step plan for plant reconversion. These are the firms who will have the jump on their competitors, come the armistice.

CHICAGO VIT men are far more than specialists in porcelain enamel finishes. They are also practical plant men who know equipment, application and firing, operating methods and short-cuts to economical efficiency. You can have this wealth of experience focused on *your* problems for the asking.



CHICAGO VIT has long been the bellwether in the development of new and better frits and in research for more efficient plant equipment and methods. It was CHICAGO VIT who put porcelain enamel on washing machines; helped develop the one piece refrigerator shell; led the industry in developing frits for special purposes, and superior frits for regular uses. Long before Pearl Harbor, CHICAGO VIT had the most comprehensive line of frits in the industry. Today we have "on the shelf" many new unannounced enamels awaiting the advent of peace.

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CHICAGO, ILLINOIS

A Division of Chicago Enamel Company

Enamel division panel discussion

A MOST interesting phase of the Enamel Division Program was the panel discussion based on questions submitted by members of the industry for discussion by panel members. The meeting was later thrown open to spirited general discussion.

Questions submitted included such topics as steel, pickling methods and procedure, enamel properties, one-coat white, enamel defects, raw materials, etc.

FINISH presents here brief notes covering some of the leading points in the discussion.

Steel

What can be done about warpage?

PORTER: Warpage of ware is influenced by several factors: (1) temper of the stock, (2) uniformity of the stock, (3) methods of racking and firing. Enameling grade stock is the best material known at the present time to minimize warpage at enameling temperatures.

Why does adherence vary in the same lot of steel?

ANDREWS: I don't believe anyone really knows why adherence should vary in the same lot of steel, but corrosion taking place in pickling influences it. Also, the oxidization characteristics have an important bearing on the results.

Is hydrogen still considered to be the chief "Boegey Man" in steel?

PORTER: H₂ plays a big part in reaction of enameling iron but is not the only thing which causes trouble. There are several sources of H₂ but I personally feel the H₂ in steel is of less importance than that contributed by the enameling operation.

"Dry Pickling"

WELLER: Gas or "dry" pickling began about seven years ago. Residual impurities left by pickling were studied in conjunction with galvanizing. In 1940 continuous pickling and galvanizing were started.

Fundamentals of "dry" pickling consists of treating the sheet with HCl with no water at 1400° F. The etch pattern is entirely different. Pickling

PANEL MEMBERS

L. E. Nordholt A. I. Andrews
R. R. Danielson F. R. Porter
B. T. Sweely C. S. Pearce
R. M. King

action from 1100-1400 is very rapid and is carried out in approximately one minute. Less bubbling and blistering is developed. The coating on the metal is very adherent. It has applications to coatings other than galvanizing.

Gas pickling provides a means of eliminating many troubles. The method is applicable to continuous pickling.

Modulated control and radiation pyrometers

GREEN: In application to box type furnaces it is fundamentally cyclic in nature. As soon as it drops below the control band a full load of fuel is demanded. Greatest use for modulated control is in connection with continuous furnaces. Radiation equipment for measuring temperature is used by sighting on the piece and picking up the radiant energy with equipment which is so calibrated as to read in degrees.

Different enamel surfaces will have different emitting qualities. Equipment is sighted on the surface and, therefore, the gauge is independent. Radiation pyrometer measurements are made in the infra red range, and unfused material will emit a lower amount of energy than a fused material. The readings for ground coat and white would be in a different range.

Antimony-free enamels

Have antimony-free enamels shown enough promise to keep them in the post-war picture?

It is common knowledge among commercial frit manufacturers that the trend in pre-war sales in this type of enamels was upward in a rapidly accelerating curve.

DANIELSON: Zircon enamels have found wide application and will be used after the war. The problem of acid resistance must be improved.

Scumming may be caused by the presence of gas bubbles, but can be overcome by careful attention to composition. Furnace gases have an important affect.

ANDREWS: Scumming is influenced by materials in the mill batch such as clays and opacifiers, and possibly electrolytes.

Ground coats and weathering

Can ordinary ground coats withstand weathering?

KING: Cites an example of an outside water jacket enameled on the inside with ground coat which was covered with Fe₂O₃ in localized areas. Also cited an example of washing machine tubs, and concluded that ground coat enamel is not sufficiently resistant to weathering.

SWEELY: In city areas where corrosive conditions are common non-acid-resistant enamels are not sufficiently resistant to weathering and AR enamels are recommended.

Electrostatic spraying

SWEELY: Process now in successful operation on paints, and feels it should have possibilities for porcelain enamel. Consists of insulated electrodes surrounding a field connected to a transformer and creates a field with high voltage and low amperage. The particles are attracted to the metal piece to be coated. Pressure consists of 6-7 pounds on the liquid and 15-16 pounds air pressure. Even coverage of the piece is obtained with very little over-spray. Material savings in the order of 30% have been claimed. The process is adaptable to production runs, and automatic spray guns, if products are of similar size and shape.

Miscellaneous

Discussed crucible smelting and problems of experimental smelting.

DANIELSON: A crucible batch is not entirely satisfactory as a guide to production smelting as gases may be entrapped.

SWEELY: Materials should be fine and thoroughly mixed.

ANDREWS: Crucible smelting does not give a correlation between crucible and large scale production.

What causes pits in black dry process enamel?

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NEWS

A. G. A. votes on reorganization plan

It is reported that the American Gas Association has approved a resolution calling for the setting up of a Natural Gas Department and a Manufactured Gas Department by a membership vote of 821 to 7.

A.G.A. will have two vice presidents who will act as chairmen of the departments. J. French Robinson, vice president of the Association and president of The East Ohio Gas Company, becomes chairman of the new Natural Gas Department. George S. Hawley, president of the Bridgeport Gas Light Company, Bridgeport, Connecticut, and a past president of the Association, is chairman of the Manufactured Gas Department.

Robert W. Kress, formerly with the special chemicals division of Pennsylvania Salt Mfg. Co., Philadelphia, Pa., is now located at the Chicago office of the company where he will act in a sales-service capacity.

Promotions at N. Y. C. S.

Promotions at the New York State College of Ceramics, Alfred, New York, include the following:

Professor R. M. Campbell, formerly Professor of Ceramic Technology, is now head of the Department of Ceramic Engineering.

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Charles M. Harder, who has been acting head of the Ceramic Department of Design, has been selected to head that department.

Assistant Professor J. F. McMahon is now Professor of Research in charge of the experimental work of the Ceramic Experiment Station.

Lt. Weill married



Lt. Bob Weill, son of Roper Corporation's personnel director, S. W. (Sol) Weill, was married recently to Claire Mary McDonell of Alhambra, California. The ceremony took place on the day of Bob's release from the U. S. Naval hospital at Corona, California, where he has been recuperating following an operation.

Miss McDonell, a graduate of the Alhambra schools, is now employed

in the offices of the Douglas Aircraft Corporation. Bob, a full fledged Marine dive bomber pilot, expects to be assigned to duty at a Marine air base, where he'll train in the Navy's new "Super" dive bomber.

Frechette to teach at Alfred

Dr. Van Derck Frechette, who studied at the New York State College of Ceramics and later took graduate work at the University of Illinois, is back at Alfred as Professor of Ceramic Technology in charge of x-ray analysis work and enamelware courses. Since receiving his Ph.D. degree at Illinois in 1941, Dr. Frechette has had valuable industrial experience, which should serve him well in his new capacity.

The new president of the Ohio Society of Professional Engineers is T. W. Rolph, vice president and chief engineer of the Holophane Company, Newark, Ohio, manufacturers of lighting products.

Consolidated Feldspar Corp., Trenton, N.J., announces the election of H. B. DuBois as vice president in charge of sales and member of the Board of Directors.

William W. Sproul, Jr., has been appointed manager of the Application Department of the Sharon Works of the Westinghouse Electric and Manufacturing Company, it has been announced by H. V. Putman, vice president.

Mr. Sproul received the degree of bachelor of science in electrical engineering in 1927 at Virginia Polytechnic Institute, and in the same year joined Westinghouse as a graduate student. From 1937 to 1942 he was in the Power Transformer Sales Section at Sharon, and from 1942 until his new appointment he served as manager of the Transformer Equipment Section.

Beck joins Minnesota Mining

It is learned that Warren R. Beck, formerly research assistant with the Department of Ceramics, School of

Mineral Industries, Pennsylvania State College, has joined the Research Staff of the Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. He will act as assistant to Dr. Nelson W. Taylor, director of ceramic research for Minnesota Mining and formerly head of the Department of Ceramics at Pennsylvania State.

Edison G. E. appointment



F. C. Margolf has been appointed manager of the home laundry equipment sales division, Edison General Electric Appliance Co., effective immediately, according to G. H. Smith, general sales manager, who made the announcement.

Mr. Margolf joined the Hotpoint organization in 1938 as a specialist on home laundry equipment, having been previously with the laundry equipment division of General Electric Company. Recently he has been assigned to commercial cooking equipment work with the U. S. Government in Washington. For the present Mr. Margolf will retain his Washington office and continue his government activities. Later he will be located at Hotpoint headquarters, Chicago.

The Battelle Memorial Institute, Columbus, Ohio, has appointed a new member to its research staff in the Ceramic Division in John B. Cahoon, Jr., formerly at the Engineering Experiment Station, Ohio State University.

Meadows announces new officers

Re-election of I. N. Merritt as president of Meadows Corporation, manufacturers of washing machines, Bloomington, Illinois, was announced recently. H. C. Burkingham was elected treasurer; H. Hoover, assistant treasurer; S. M. Forester is the new secretary and W. F. Oberst is vice president and plant manager.

W. G. Martin of A. O. Smith Corporation is president, and N. A. Capo of Pittsburgh Water Heater Corporation is secretary of the newly formed Porcelain Enamored Water Tank Manufacturers Association.

Companies who will work cooperatively are:

Erie Enameling Company
Fowler Manufacturing Company
Pittsburgh Water Heater Corporation
Porcelain Metal Products Company
Porcelain Metals, Inc.
A. O. Smith Corporation

McCarthy heads Bendix Chicago office

A. L. McCarthy was recently appointed manager of the newly established Chicago branch of Bendix Home Appliances, Inc. He was formerly with Bendix located in Detroit.

In making the announcement J. S. Sayre, company president, said, "The establishment of the Chicago branch does not in any way change the announced policy of the company. We shall continue our policy of dealing through independent distributors. We have only two factory branches—Chicago and Cleveland."

J. H. Frohlich recently returned to Norge Division, Borg-Warner Corp., as promotion manager. Mr. Frohlich has been located in Indianapolis serving as district manager of the War Production Board. He has long been associated with the household appliance field.

Truesdell joins Crosley

L. C. Truesdell, formerly in charge of dealer development for Frigidaire,

Division of General Motors Corp., has recently joined Crosley Corporation, Cincinnati, in an executive sales capacity. This new Crosley appointee is a well-known figure in the appliance field.

Parker to OPA

It is reported that Fred L. Parker has been appointed new chief of OPA's heating and cooking equipment branch. Mr. Parker was with Phillips and Buttorff, Nashville, Tenn., for a number of years and was later vice president of United States Stove Corp., Pittsburgh. Mr. Parker takes to OPA seventeen years' experience in the stove industry.

Executive Officer Wheeler



Maj. P. M. (Port) Wheeler, Jr., formerly on the technical-service staff at Chicago Vitreous Enamel Product Co., and a former reserve officer, assumed active duty in the Armed Services in January, 1942. He attended school at Ft. Sill, Oklahoma, until May of the same year. He was then assigned to the 316th Field Artillery Battalion of the 81st Infantry (Wildcat) Division at Camp Rucker, Alabama. He has been the Battalion S-3 most of the time until in recent months, and is now Executive Officer. His promotion shows excellent progress in his Army work, having re-

ceived a Captaincy in September, 1942, and the gold leaf of Major in April, 1943.

**Carnegie-Illinois appoints
George L. Davis**



Mr. Davis was recently appointed general staff manager of sales for Carnegie-Illinois Steel Corporation. Our information is that he covered the steel industry all along the line. He has spent 9 years in steel mill operations, 11 years in sales, and 7 years in general management. An aviator in World War I, George helps keep World War II aviators supplied with fighting steel. He left his post as vice president of the Diamond Power Specialty Corporation, Detroit, to accept his present job.

Gas kitchen program approved

At its meeting of February 16, 1944 the Executive Board of the American Gas Association approved the Co-ordinated Gas Kitchen program, recommended by the Post-War Planning Committee.

Mr. C. V. Sorenson, chairman, Residential Gas Section, will serve as coordinator of the efforts of the manufacturers and utilities in developing the Coordinated Gas Kitchen sponsored by the Association's Post-War Planning Committee. A special committee under the chairmanship of Mr. John H. Warden, vice-chairman of the Residential Gas Section and sales manager of the Oklahoma Natural Gas Company of Tulsa, Okla., has charge of the promotional aspects of

the program under the guidance of Mr. Sorenson.

The committee also will include representatives of the Association of Gas Appliance and Equipment Manufacturers.

Mr. and Mrs. Warren Copp announce the arrival of a new daughter at their home — R.D. 4, St. Clairsville, Ohio. Carolyn, movie star daughter of the Copps, was accorded the privilege of naming the new arrival — Evelyn Warren Copp. Says Carolyn, "The middle name is inconsequential."

Mr. Copp is well known in the enameling industry in connection with his position with Wheeling Steel Corporation.

Daily heads Bendix advertising

Walter J. Daily, the new advertising director of Bendix Home Appliances, Inc., South Bend, Indiana, needs no introduction to the electrical appliance industry. For over eight years he was advertising and sales promotion manager of the electric refrigeration department of General Electric; before that advertising manager of the Electric Vacuum Cleaner Company.



For the last four years, Daily was an officer in Roy S. Durstine, Inc., New York advertising agency. He is a former director of the Association of National Advertisers and a graduate of Yale University.

Westinghouse names new refrigeration manager



T. J. Newcomb, sales manager of Westinghouse Electric Appliance Division, has announced the appointment of George H. Meilinger as manager of the household refrigeration department. This move was made, according to Mr. Newcomb, in preparation for the biggest refrigerator production program in the company's history. Mr. Meilinger will direct post-war development, manufacture and sale of home refrigeration equipment, including models equipped with food freezing compartments.

Information has reached us that Paul Redlich, president of Rotospray Mfg. Co., Chicago, Illinois, and Mrs. Redlich were in an automobile accident on Chicago's Outer Drive Wednesday, March 29. Although both were in the hospital as a result of their injuries, *finish* is glad to report that they are home now recuperating, and Mr. Redlich expects to be back in his office in the very near future.

Julius Horelick, formerly production manager at Baltimore Enamel and Novelty Company, Baltimore, Md., is now assistant plant superintendent of Rheem Manufacturing Company, Research Division, of the same city.

A. G. A. E. M. meeting

The Association of Gas Appliance and Equipment Manufacturers will hold its Annual Meeting at the Palmer House, Chicago, Illinois on May 8 and 9.

IN A HURRY FOR

CHEMICALS?

BY THE POUND



BY THE CARLOAD



Come to us for action

● Prompt attention to large or small orders . . . from making them ready for shipment . . . to moving them out and on the way to destination . . . is one of Harshaw's fundamental policies responsible for having customers of long standing and for adding new customers regularly. Many Purchasing Agents find it convenient and satisfying to have one source of supply . . . whether ordering a bottle of chemicals for the laboratory or a carload for the plant. Their

orders must get attention and action . . . no matter what size.

During the past 50 years this recognition of the importance of action in filling orders has played a responsible part in Harshaw's steady growth.

For Technical, Reagent, C.P. Chemicals, Glassware, Apparatus and Laboratory Furniture, send your order to Harshaw Scientific, Cleveland 6, Ohio, or to branches in Cincinnati and Detroit.

For Industrial Chemicals, send your order to Harshaw Chemical Co., Cleveland 6, Ohio, or to branches in Chicago, Cincinnati, Detroit, Houston, Philadelphia, Pittsburgh, New York.

THE HARSHAW CHEMICAL CO., 1945 E. 97th St., Cleveland 6, Ohio

Please send me a copy of your 32-page booklet
check listing industrial chemicals.

My Name _____

Company Name _____

City _____

State _____

42

HARSHAW SCIENTIFIC, 1945 East 97th Street, Cleveland 6, Ohio

Please send me your 72-page price list of labora-
check tory chemicals and equipment.

APRIL • 1944 finish

From the Editor's mail...

American Central Mfg. Corp., Connersville, Indiana.
"A definite need for the entire industry."

Kenneth Cook, Sup. Material Control

The American Rolling Mill Co., Middletown, Ohio.

"Good Luck! The Industry needs just such a unified voice, and I think the name is well chosen, for we do know that Porcelain Enamel is tops in finish, and finish is going to mean more in the post-war world than ever before."

Bennett Chapple, Assistant to President.

Benjamin Electric Mfg. Company,
Des Plaines, Illinois.

"I was particularly interested in examining the first issue of your new magazine "Finish." I was amazed at the completeness of this issue especially since I remember rather clearly the lack of completeness present in the first issue of other trade magazines that have since become rather successful.

"Obviously there is a real need for a magazine like Finish, and I am sure that you will be completely successful."

Hoyt P. Steele, Vice President,
In Charge of Engineering and Research.

Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.

"Trade papers for years have been accepted as the documents of any given industry and certainly the porcelain enameling field has a need of a truly independent voice, which can be called their own paper . . . Your editorial policy plus the acceptance you are bound to get in the field practically guarantees "Finish" to be of profound interest to every conceivable section of one of America's most forward thinking industries."

Robert J. Ritchey, Assistant Manager,
Market Development Bureau.

Comstock-Castle Stove Co., Quincy, Illinois.

"I have always felt that the porcelain enamel industry needed a trade paper and I do know that with your experience and background that you are the man to do this job."

"You have my best wishes for a steady success in this new field."

R. W. Spake, President

Frigidaire Division, General Motors Corp.,
Dayton, Ohio.

"A magazine of this type is needed in the finishing field."

Harry J. Velker, Supervisor.

The Baltimore Enamel and Novelty Co.,
Baltimore, Md.

"No doubt your move is the result of many comments that have come from the principals of our industry, who have recognized the need of such a book."

"The many developments in porcelain enamel, as well as other inorganic finishes during the war period, makes your move of particular interest to me. I am sure that an unbiased source of technical information as well as practical application will be helpful in our business. I believe that you can count on the wholehearted co-operation of our industry."

George S. Blome, Vice President.

now necessary for individual companies to make in order to cover the field.

"Make a good, unbiased Industry publication out of "Finish" and you will have my hearty support."

R. G. Calton, Executive Vice President.

Florence Stove Company, Gardner, Massachusetts.

"I want to compliment you on your publication of "Finish." The articles that have been published in it have been of intense interest and I wish you much success."

F. H. Schneider, Manager,
Merchandise Development.

The Harshaw Chemical Company, Cleveland, Ohio.

"As our requirements, both for advertising and for news releases, may be somewhat typical of the general supplier in the industry I think our attitude toward "Finish" is likewise representative.

"Our feeling has always been that the Porcelain Enamel Industry has not been covered adequately by any one publication, suitable for our use . . .

"Until we heard about "Finish" it was our intention to devote most of our advertising and promotional budget to direct mail . . . It is fairly obvious our having a paper such as yours, in which to advertise, makes it possible for us to reach the market at a lower expense, and incidentally with a lower expenditure of paper.

"Our experience with (———) has been it is too general to make a good paper for us. It does not reach all of the people we want to reach in the enamel field, and it does not secure the kind of reader attention in the enamel field that a definite enamel magazine would.

"The Enamel Industry has still a very important production program of war material. They have many problems involved in going back to enameling, and there are developments in sight which will warrant real attention.

"Therefore I believe both from the viewpoint of the industry and from our viewpoint, your publication "Finish" will do an essential job."

John W. Illiff, Manager Ceramic Department.

Ingersoll Steel & Disc Division, Borg-Warner Corp.,
Chicago, Illinois.

"As to your new endeavor, I most heartily recommend it. There has been a need of just the type of publication you contemplate. I have only been directly concerned with enameling for five years and certainly some of the problems that worried me would have been cleared up with an edition . . .

"Joe Thornton advised me that your type of publication would be of considerable aid to ambitious beginners in the enameling industry toward improving their knowledge and positions and that an interchange of practical shop information should help everyone in the industry.

"Feel free to call on me for any assistance I can be to you . . ."

W. J. Walters, Asst. Works Manager.

Tennessee Enamel Manufacturing Co.,
Nashville, Tennessee.

"I believe your idea of a specialized publication for the enameling industry will meet with real success . . .

"Such a publication as "Finish" could certainly have been used to good advantage by the Industry during our conversion to war work — and can unquestionably be equally helpful at this time and during our reconversion period. I believe one independent publication of this nature can do a great deal to coordinate the Industry and carry constructive information — and could logically make unnecessary a lot of individual mailings which are

General Porcelain Enameling and Mfg. Co.,
Chicago, Illinois.

"This periodical can well fill a desired need by the industry. With a circulation as you have planned and the publicity which such a periodical could give the Porcelain Enamel Institute Forum, I am sure the Forum of the future could far exceed our expectations."

F. E. Hodek, Jr., President.

Republic Steel Corporation, Cleveland, Ohio.

"Good ideas are what make things go when properly followed up and it seems to us you have a good idea which, backed with your enthusiasm and publicity ability, will surely benefit the industry in the post-war days ahead when straight thinking and wise planning will be greatly needed.

"We must not allow "substitutes" to usurp our place in the sun; therefore, your efforts should meet with enthusiastic approval from all concerned. More power to you."

L. D. Mercer, Asst. Manager of Sales.

University of North Carolina, Department of Ceramic Engineering, Raleigh, N. C.

The idea . . . of providing information concerning the entire Ceramic Finishing Field is commendable . . . This field, broadly speaking, is very large and should provide a tremendous amount of information . . .

"Our department will be only too glad to cooperate with you in any way we possibly can to make the magazine a success . . ."

R. L. Stone, Acting Head Ceramic Engineering Dept.

The American Ceramic Society, Inc.,
Columbus, Ohio.

"You have produced a most excellent publication. Your make-up is excellent. Your many new innovations are attractive. Your news coverage seems to be quite complete."

"Congratulations!"

Ross C. Purdy, General Secretary.

John B. Pierce Foundation, New Haven, Conn.

"Very well pleased with initial issue."

G. M. Rapp, Research Engineer.

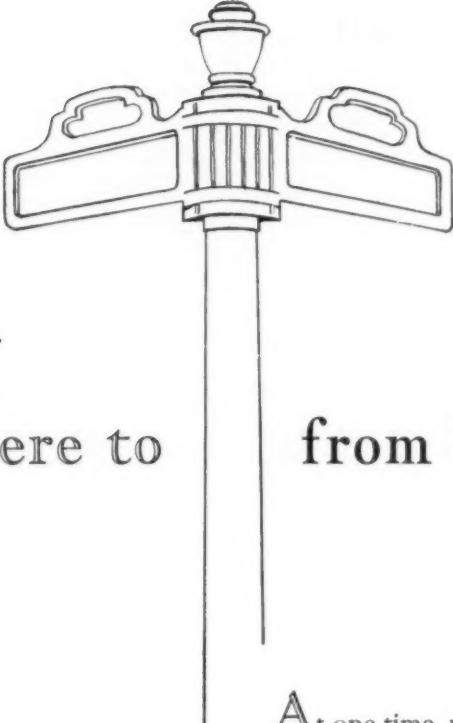
Pressed Metal Institute, Cleveland, Ohio.

"We have looked over carefully and with interest the first issue of your magazine "Finish." To our knowledge there has been no magazine devoted to porcelain enamel on steel. On the other hand, porcelain enamel on steel has played an important part in the development and wide consumer use of many major appliances. We believe that it will be used extensively in the post-war era.

"We also believe that the magazine which you have started will serve an important function in the coming months in bringing before designers and production engineers considering post-war products the values of porcelain enamel steel.

"We shall look forward with interest to your coming issues and wish you the best of success."

W. W. Galbreath, Executive Vice President.



Where to from here?

At one time, war conversion of the Porcelain Enameling Industry seemed an almost impossible and discouraging task. But P.E.I. proved that it could be done and showed the way . . . again illustrating the advantage of group action as compared to individual company action.

Now, however, it is important to look ahead, to think and plan constructive industry action, to pave the way for the soundest possible approach to our normal markets . . . so that when materials are again available for civilian production, the members of this Industry will be ready to go . . . and in high gear.

P.E.I. already has started the ball rolling in this direction through its Market Research and Development Program . . . designed to benefit and build a more secure future for the entire industry.

PORCELAIN ENAMEL INSTITUTE

Incorporated

1010 VERNONT AVENUE, N. W.

WASHINGTON • 5 • D. C.



APRIL • 1944 finish

Lansdale Porcelain does hydrogen annealing

A RECENT visitor at *finish* headquarters was John Krupp, vice president and general manager of Lansdale Porcelain Enamel Company, Lansdale, Pa.

From Mr. Krupp we obtained a brief outline of some interesting heat treating work his company is doing in connection with important war product production.

The company has been specializing in heat treating work since early in the war when there was a dearth of suitable sources for this specialized work and a serious bottleneck threatened. Work done by the Lansdale Company includes a variety of parts and products that could logically be handled with the equipment available.

In normal times this company is in the Job Enameling business with facilities for the fabricating and enameling of a wide variety of products. One type of pre-war work done by Lansdale was architectural porcelain. The "bank columns" used to illustrate the article in the March issue of *finish* (When Are You and Building Going to Get Together? — by Howard Myers, The Architectural Forum) were fabricated and enamelled by this company for the Superb Bronze Company of Brooklyn, N.Y.

Mr. Krupp said that a large part of the heat treating work they are doing consists of hydrogen annealing. Of interest to the enameler is the fact that this work is being done with standard box type enameling furnaces and standard loading equipment.

The parts annealed include nickel-alloy laminations for radio and other electrical industry products. The nickel-alloy parts are placed in 10" x 14" x 22" hot rolled steel containers, which are then sealed by welding. Hydrogen is piped into the containers to provide the specified atmospheric requirements.

Temperatures are high so that the furnaces will require new muffles for porcelain enameling but, according to Mr. Krupp, the company will be

ready with a minimum of plant changes to swing back into the work for which the plant was established.

The enameling business in Pennsylvania and the East is expected to flourish after the war, and Lansdale plans to be ready to get away to a quick start when this time comes.

Lansdale men in service include: Staff Sergeant Robert (Bob) Krupp, brother of the president and vice president of the company. "Bob" entered the Service during the summer of 1941. He is now a maintenance chief with the A.A.F. based at Yuma, Arizona.

1st Lieutenant Leroy Reading, formerly sales manager for the company, has been in the Infantry since July, 1942. He is stationed at Camp Mead, Maryland.

P.E.I. Development Committee studies new processes

A REVOLUTIONARY process of cleaning with molten salts was discussed at the meeting of the Porcelain Enamel Institute Process Development Committee, Wednesday, April 5, 1944 at Pittsburgh. This process is very much similar to the methods now used for de-enameling with molten caustic. It has not been completely developed yet, but has large possibilities.

De-beading by the electrostatic method does not seem to work on porcelain enamels, probably due to the presence of water. However, the spraying of enamels under charge by this method has possibilities and will be developed further by the patent holders.

Infra-red drying is not as well adapted to porcelain enamel operations as first supposed.

These reports and several others on various phases of processing will be issued in the near future by the Porcelain Enamel Institute.

Following are processes to be covered, and the committee members to whom they have been assigned:

1. Metal Cleaning . . G. W. Dykstra
 - a. Multiple tanks
 - b. Repeat tanks
2. Pickling H. D. Carter
 - a. Use of repeat tanks
 - b. Electrolytic
 - c. Nickle dip
3. Spraying Joseph Hoehl
 - a. Electrolytic precipitation
 - b. De-beading

4. Drying R. M. King
 - a. Infra-Red
 - b. Circulation
5. Induction Heating L. E. Nordholt
 - a. For drying
 - b. For firing
6. Di-Electric Heating L. E. Nordholt
 - a. For drying
 - b. For firing
7. Atmospheric Control in Furnaces A. I. Andrews
8. Air Cleaning Not Assigned
 - a. For processing
 - b. For recovery of materials
9. Use of Soft Ground Coats to Burn With Cover Coats Not Assigned
10. Dipping Versus Spraying in Application of Ground Coats Not Assigned
11. Enameling Iron Development as Affecting Processing F. R. Porter

"Lou" Lange joins the Navy

Louis A. Lange, for the past four and a half years sales representative throughout the mid-western states for the United Clay Mines Corp., Trenton, N.J., has been commissioned a Lieutenant (jg) in the U. S. Navy. At the present time he is stationed at Princeton University, Princeton, N.J.

Let CLYDE handle your Porcelain on Steel Problems

LIKE most industrial plants, Clyde has been busy with war production, but is prepared to handle your porcelain on steel requirements promptly and efficiently.

Newspaper headlines are daily pointing to production of household equipment in essential quantities for 1944. For those manufacturers who will be returning to civilian production of essential items, Clyde offers a complete porcelain on steel finishing service.

Our wide experience in the application of this most durable of finishes on table tops, washing machine tubs, bath tubs, sinks, lavatories, and innumerable other fabricated products affords a background of production finishing knowledge that is invaluable to the product manufacturer needing this service.

As your plans materialize for production requiring a lifetime porcelain on steel finish, answer your finishing problems by calling on jobbing specialists —



**CLYDE PORCELAIN STEEL CORPORATION
CLYDE, OHIO**

The Eastern Enameler's Club
first meeting
on
Postwar Problems
Ritz-Carlton Hotel
Broad and Walnut Streets
Philadelphia, Pennsylvania
Saturday Afternoon
3 P. M. May 6, 1944

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*Housewives
 Prefer...*



T-K UNITS . . the speedy, efficient heating units that have been chosen for standard equipment by a majority of America's leading electric range manufacturers. Thousands of dependable, long-lived T-K's have been serving economically, day after day, in American homes during the war emergency. Housewives have learned to appreciate their fine quality, their ability to keep on serving long after less ruggedly-built units have given up under the strain, and they greatly prefer the easy-to-clean feature of T-K Units. Today's T-K's are precision built to standards of quality, uniformity and efficiency unsurpassed in the history of the industry. Makers of good electric ranges are invited to discuss post-war plans with us NOW! Send for information on the complete T-K line . . on amazing new T-K developments in electric range heat control.

TUTTLE & KIFT INC.
 1825 No. Monitor Ave. • Chicago 39, Ill.



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